11N Wireless

Multi-Function Client Bridge

User’s Manual

Version: 1.0

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Revision History

Version	Date	Notes
1.0	July 10, 2009	Initial Version

1 Introduction

ECB9300 is a multi-functioned 11n product with 7 major multi-functions, is designed to operate in every working environment for enterprises.

ECB9300 is a Wireless Network device that delivers up to 3x faster speeds and 2x extended coverage than 802.11g devices. ECB9300 supports home network with superior throughput, performance and unparalleled wireless range.

To protect data during wireless transmissions, ECB9300 encrypts all wireless transmissions through WEP data encryption and supports WPA/WPA2. ECB9300 also supports IEEE 802.1x Supplicant function in CB mode. Its MAC address filter allows users to select stations with access to connect network. In addition, the function of user isolation protects private network between client users. ECB9300 thus is the best product to ensure network safety for enterprises.

1.1 Features and Benefits

Features	Benefits
High Speed Data Rate Up to 150Mbps	Capable of handling heavy data payloads such as MPEG video streaming
10/100 Fast Ethernet	Support up to 100Mbps networking speed
IEEE 802.11n draft Compliant and backward compatible with 802.11b/g	Fully compatible with IEEE 802.11b/g/n devices
Multi-Function, 7 functions	Allowing users to select different mode in various environment
Point-to-point, Point-to-multipoint Wireless Connectivity	Allowing to transfer data from buildings to buildings
WDS (Wireless Distributed System)	Making wireless AP and Bridge mode simultaneously as a wireless repeater
Universal Repeater	The easiest way to your wireless network's coverage
Support Multi-SSID function (4 SSID) in AP mode	Allowing clients to access different networks through a single access point and to assign different policies and functions for each SSID by manager
WPA2/WPA/ IEEE 802.1x support	Powerful data security
802.1x Supplicant support (CB & CR mode)	More powerful data security in Client Bridge mode
MAC address filtering in AP mode	Ensuring secure network connection
User isolation support (AP mode)	Protecting the private network between client users.

PPPoE function support (CR mode)	Easy to access the internet via ISP service authentication
Keep personal setting	Keeping the latest setting when firmware upgrade
SNMP Remote Configuration Management	Helping administrators to remotely configure or manage the Access Point easily
QoS (WMM) support	Enhancing user performance and density

1.2 Package Contents

Open the package carefully, and make sure that none of the items listed below are missing. Do not discard the packing materials, in case of return; the unit must be shipped in its original package.

- 1* 11N multi-function Client Bridge (ECB9300)
- 1* 12V/1A Power Adapter
- 1* Ethernet Cable
- 1* 2dBi 2.4GHz Dipole Antennas
- 1*QIG
- 1*CD (User's Manual)

1.3 Safety Guidelines

In order to reduce the risk of fire, electric shock and injury, please adhere to the following safety guidelines.

- Carefully follow the instructions in this manual; also follow all instruction labels on this device.
- Except for the power adapter supplied, this device should not be connected to any other adapters.
- Do not spill liquid of any kind on this device.
- Do not place the unit on an unstable stand or table. This unit may drop and become damaged.
- Do not expose this unit to direct sunlight.
- Do not place any hot devices close to this unit, as they may degrade or cause damage to the unit.
- Do not place any heavy objects on top of this unit.
- Do not use liquid cleaners or aerosol cleaners. Use a soft dry cloth for cleaning.

1.4 System Requirements

The following are the minimum system requirements in order configure the device.

- PC/AT compatible computer with a Ethernet interface.
- Operating system that supports HTTP web-browser

1.5 Applications

The wireless LAN products are easy to install and highly efficient. The following list describes some of the many applications made possible through the power and flexibility of wireless LANs:

a) **Difficult-to-wire environments**
   There are many situations where wires cannot be laid easily. Historic buildings, older buildings, open areas and across busy streets make the installation of LANs either impossible or very expensive.
b) **Temporary workgroups**
   Consider situations in parks, athletic arenas, exhibition centers, disaster-recovery, temporary offices and construction sites where one wants a temporary WLAN established and removed.
c) **The ability to access real-time information**
   Doctors/nurses, point-of-sale employees, and warehouse workers can access real-time information while dealing with patients, serving customers and processing information.
d) **Frequently changed environments**
   Show rooms, meeting rooms, retail stores, and manufacturing sites where frequently rearrange the workplace.
e) **Small Office and Home Office (SOHO) networks**
   SOHO users need a cost-effective, easy and quick installation of a small network.
f) **Wireless extensions to Ethernet networks**
   Network managers in dynamic environments can minimize the overhead caused by moves, extensions to networks, and other changes with wireless LANs.
g) **Wired LAN backup**
   Network managers implement wireless LANs to provide backup for mission-critical applications running on wired networks.
h) **Training/Educational facilities**
   Training sites at corporations and students at universities use wireless connectivity to ease access to information, information exchanges, and learning.

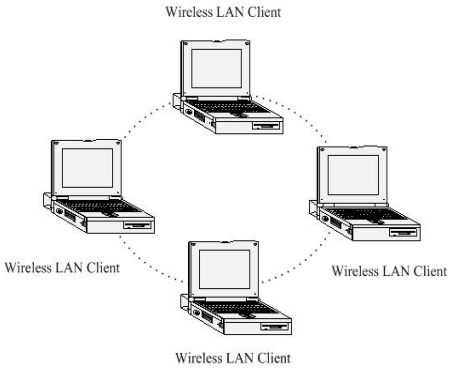
1.6 Network Configuration

To better understand how the wireless LAN products work together to create a wireless network, it might be helpful to depict a few of the possible wireless LAN PC card network configurations. The wireless LAN products can be configured as:

a) Ad-hoc (or peer-to-peer) for departmental or SOHO LANs.
b) Infrastructure for enterprise LANs.

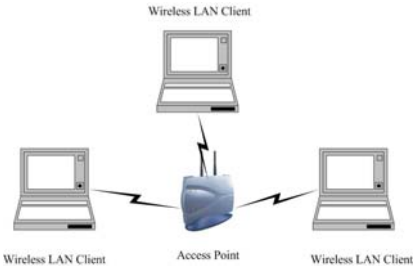
a) Ad-hoc (peer-to-peer) Mode

This is the simplest network configuration with several computers equipped with the PC Cards that form a wireless network whenever they are within range of one another. In ad-hoc mode, each client is peer-to-peer, would only have access to the resources of the other client and does not require an access point. This is the easiest and least expensive way for the SOHO to set up a wireless network. The image depicts a network in ad-hoc mode.



b) Infrastructure Mode

The infrastructure mode requires the use of an access point (AP). In this mode, all wireless communication between two computers has to be via the AP. It doesn't matter if the AP is stand-alone or wired to an Ethernet network. If used in stand-alone, the AP can extend the range of independent wireless LANs by acting as a repeater, which effectively doubles the distance between wireless stations. The image below depicts a network in infrastructure mode.

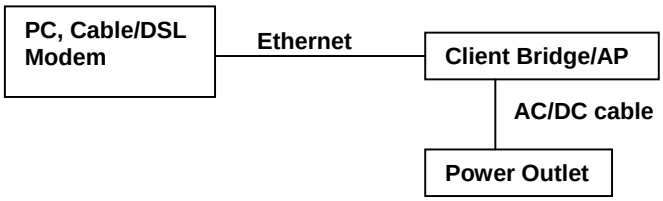


2 Understanding the Hardware

2.1 Hardware Installation

1. Place the unit in an appropriate location after conducting a site survey.
2. Plug one end of the Ethernet cable into the LAN port of the device and another end into your PC/Notebook.
3. Plug one end of another Ethernet cable to WAN port of the device and the other end into you cable/DSL modem (Internet)
4. Insert the DC-inlet of the power adapter into the port labeled “DC-IN” and the other end into the power socket on the wall.

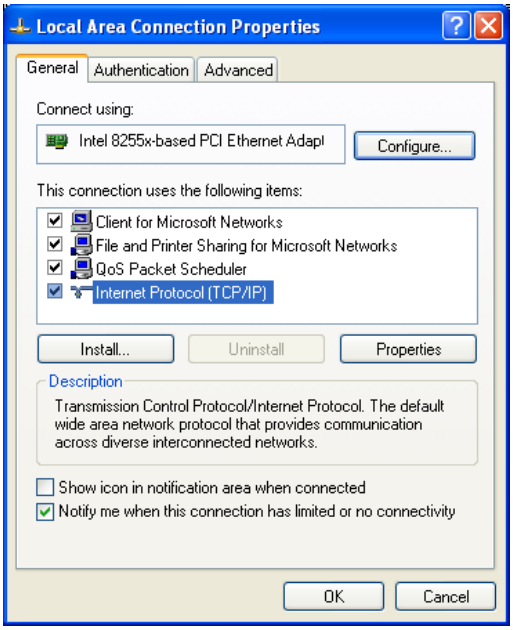
This diagram depicts the hardware configuration



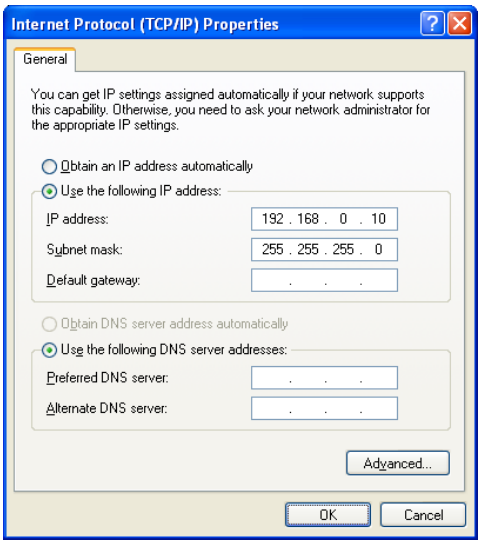
2.2 IP Address Configuration

This device can be configured as a Bridge/Router or Access Point. The default IP address of the device is **192.168.1.2** (In Client Bridge Mode as default)In order to log into this device, you must first configure the TCP/IP settings of your PC/Notebook.

1. In the control panel, double click Network Connections and then double click on the connection of your Network Interface Card (NIC). You will then see the following screen.



2. Select **Internet Protocol (TCP/IP)** and then click on the **Properties** button. This will allow you to configure the TCP/IP settings of your PC/Notebook.


Internet Protocol (TCP/IP) Properties
General
You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.
Obtain an IP address automatically
Use the following IP address:
IP address:
192 . 168 . 0 . 10
Subnet mask:
255 . 255 . 255 . 0
Default gateway:
Obtain DNS server address automatically
Use the following DNS server addresses:
Preferred DNS server:
Alternate DNS server:
Advanced...
OK
Cancel

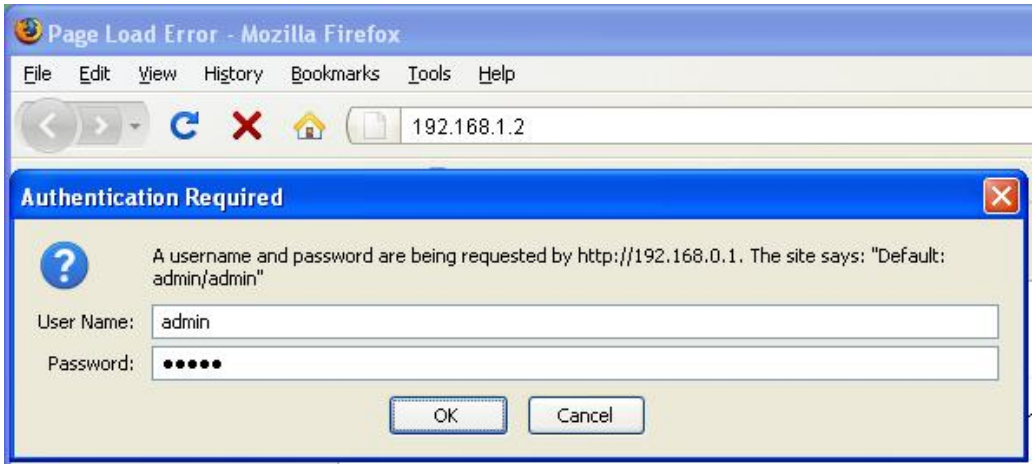
3. Select **Use the following IP Address** radio button and then enter the IP address and subnet mask. You may follow the example below. Please Ensure that the IP address and subnet mask are on the same subnet as the device.
   For Example: Device IP address: 192.168.1.2
   PC IP address: 192.168.0.10
   PC subnet mask: 255.255.255.0

4. Click on the **OK** button to close this window, and once again to close LAN properties window.

3 Web Configuration

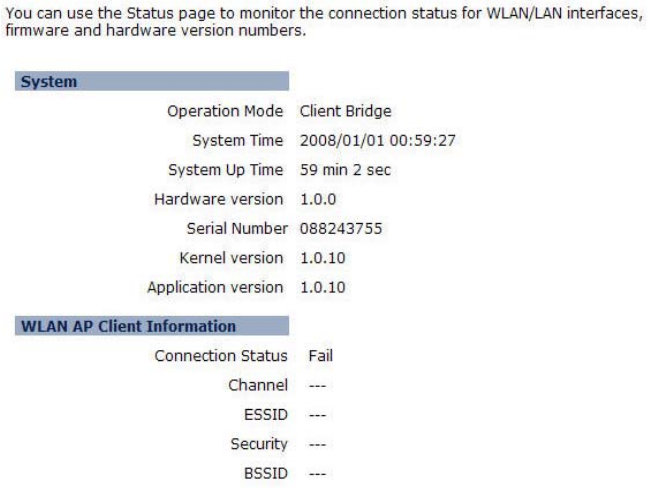
3.1 Logging In

- To configure the device through the web-browser, enter the IP address of the Bridge (default: **192.168.1.2**) into the address bar of the web-browser and press **Enter**.
- Make sure that the device and your computers are configured on the same subnet. Refer to **Chapter 2** in order to configure the IP address of your computer.
- After connecting to the IP address, the web-browser will display the login page.
- Enter **admin** for both the user name and password.

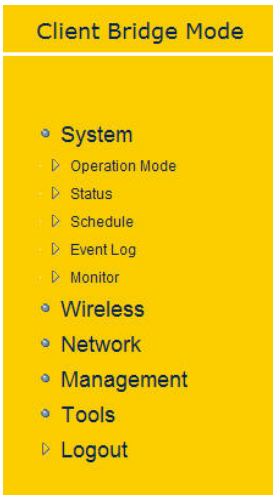


- After logging in you will see the graphical user interface (GUI) of the device. The navigation drop-down menu on left is divided into five main sections:

1. **System**: This menu includes the status, schedule, event log, and monitor.
2. **Wireless**: This menu includes status, basic, advanced, security, WPS, Client list, VLAN, and WMM. Through this section, you can also change the device operating mode, such as Access Point, Client Bridge, WDS Bridge, or Universal Repeater.
3. **Network**: This menu includes status, and LAN.
4. **Management**: This menu includes the admin setup, SNMP, firmware upgrade, save/restore backup and device reset.
5. **Tools**: Displays the time zone, power saving, and diagnostics.
6. **Logout**: To logout the system. Need to open up a new browser window in order to login again.


You can use the Status page to monitor the connection status for WLAN/LAN interfaces, firmware and hardware version numbers.
System
Operation Mode Client Bridge
System Time 2008/01/01 00:59:27
System Up Time 59 min 2 sec
Hardware version 1.0.0
Serial Number 088243755
Kernel version 1.0.10
Application version 1.0.10
WLAN AP Client Information
Connection Status Fail
Channel ---
ESSID ---
Security ---
BSSID ---

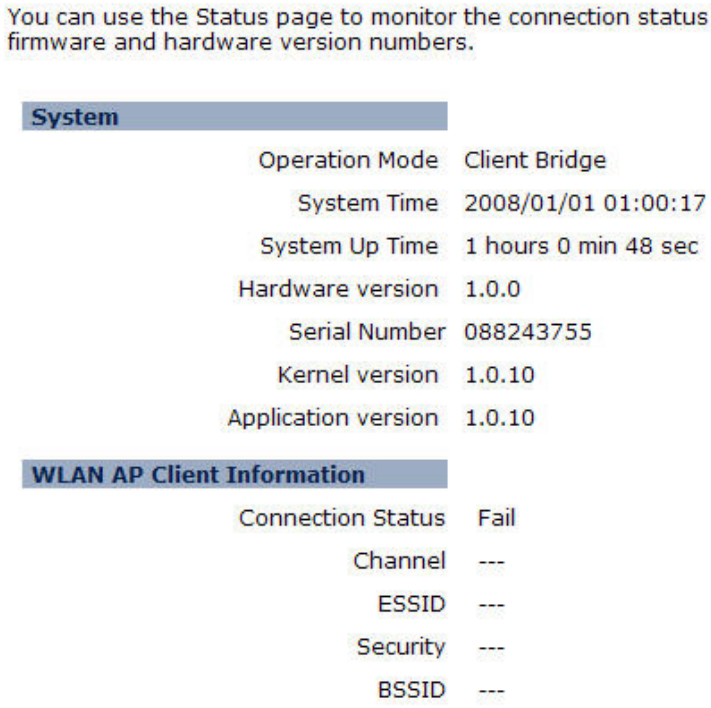
3.2 System



- Click on the **System** link on the navigation drop-down menu. You will then see five options: Operation Mode, Status, Schedule, Event Log, and Monitor. Each option is described in detail below.

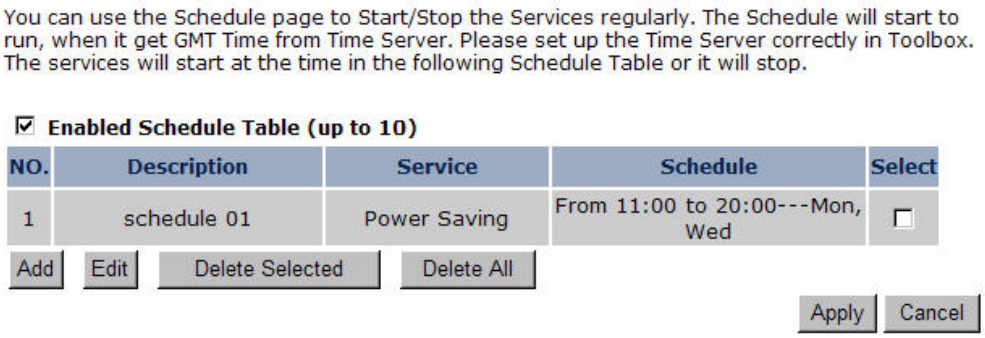
3.2.1 Status

- Click on the **Status** link under the **System** drop-down menu. The status page displays a summary of current system settings. Information such as operating mode, system up time, firmware version, serial number, kernel version and application version are displayed in the 'System' section. LAN IP address, subnet mask, and MAC address are displayed in the 'LAN' section. In the 'WLAN' section, the frequency, channel is displayed. Since this device supports multiple-SSIDs, the details of each SSID, such as ESSID and its security settings are displayed in the 'SSID_#' section.

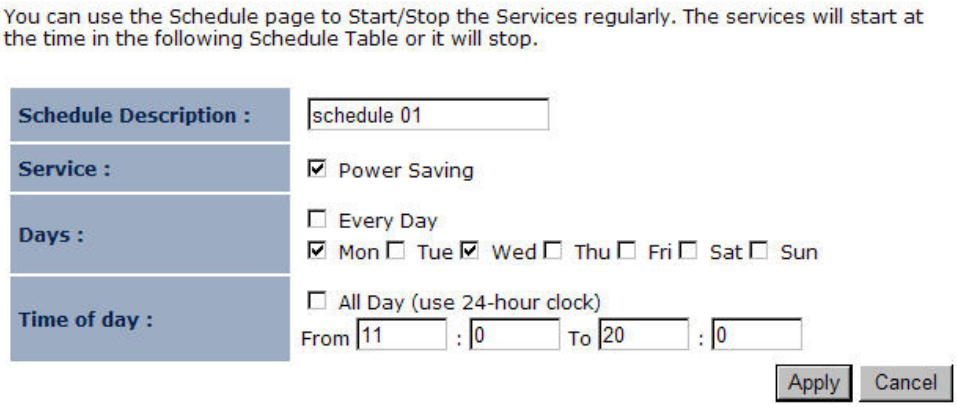

You can use the Status page to monitor the connection status for WLAN/LAN interfaces, firmware and hardware version numbers.
System
Operation Mode Client Bridge
System Time 2008/01/01 01:00:17
System Up Time 1 hours 0 min 48 sec
Hardware version 1.0.0
Serial Number 088243755
Kernel version 1.0.10
Application version 1.0.10
WLAN AP Client Information
Connection Status Fail
Channel ---
ESSID ---
Security ---
BSSID ---

3.2.2 Schedule

- Click on the **Schedule** link in the navigation menu. Prior to setting schedule, **time zone** must be set in the **Tools** menu. Schedules can be created to specify the occasions to enforce the rules.
- For example, if you want enable power saving on Mon-Fri from 3pm to 8pm, you could create a schedule selecting Mon, Tue, Wed, Thu, and Fri and enter a Start Time of 3pm and End Time of 8pm.


You can use the Schedule page to Start/Stop the Services regularly. The Schedule will start to run, when it get GMT Time from Time Server. Please set up the Time Server correctly in Toolbox. The services will start at the time in the following Schedule Table or it will stop.
Enabled Schedule Table (up to 10)
NO.
Description
Service
Schedule
Select
1
schedule 01
Power Saving
From 11:00 to 20:00---Mon, Wed
Add
Edit
Delete Selected
Delete All
Apply
Cancel

- Click on the **Add** button to add a new schedule. .


You can use the Schedule page to Start/Stop the Services regularly. The services will start at the time in the following Schedule Table or it will stop.
Schedule Description :
schedule 01
Service :
Power Saving
Days :
Every Day
Mon Tue Wed Thu Fri Sat Sun
Time of day :
All Day (use 24-hour clock)
From 11 : 0 To 20 : 0
Apply
Cancel

- **Schedule Description**: Specify a name for the schedule.
- **Service**: Select a service.
- **Days**: Select the days at which you would like the schedule to be effective.
- **Time of Day:** Place a check in the **All Day** box if you would like the schedule to be active for 24 hours. If you do not use the 24 hours option, you may specify a start time and end time.
- Click on the **Apply** button to add this schedule into the list.

3.2.3 Event Log

- Click on the **Event Log** link on the navigation menu. The device automatically records important events in its internal memory. Order records will be over-written by the latest ones when it is out of internal memory.

View the system operation information.

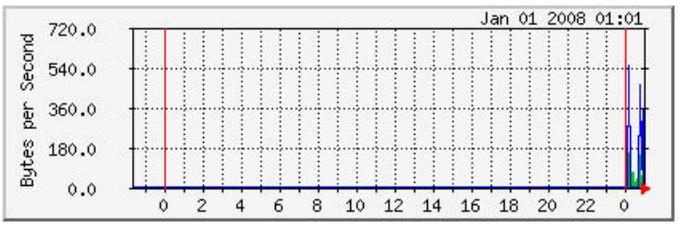
day 1 00:59:11 [SYSTEM]: NET, Firewall Disabled
day 1 00:59:11 [SYSTEM]: NET, NAT Disabled
day 1 00:59:10 [SYSTEM]: NET, stop Firewall
day 1 00:59:10 [SYSTEM]: NET, stop NAT
day 1 00:59:10 [SYSTEM]: SCHEDULE, Schedule is waiting for NTP time
day 1 00:59:10 [SYSTEM]: SCHEDULE, Schedule Stopping
day 1 00:59:10 [SYSTEM]: QoS, Stopping
day 1 00:59:10 [SYSTEM]: NTP, start NTP Client
day 1 00:59:10 [SYSTEM]: UPNP, start
day 1 00:59:09 [SYSTEM]: LAN, IP address=192.168.1.2
day 1 00:59:09 [SYSTEM]: LAN, start
day 1 00:59:09 [SYSTEM]: LAN, Stopping
day 1 00:00:05 [SYSTEM]: TELNETD, start Telnet-cli Server
day 1 00:00:05 [SYSTEM]: HTTP, start
day 1 00:00:04 [SYSTEM]: NET, Firewall Disabled
day 1 00:00:04 [SYSTEM]: NET, NAT Disabled
day 1 00:00:04 [SYSTEM]: NTP, start NTP Client
day 1 00:00:03 [SYSTEM]: UPNP, start
day 1 00:00:03 [SYSTEM]: LAN, IP address=192.168.1.2
day 1 00:00:03 [SYSTEM]: LAN, start
day 1 00:00:02 [SYSTEM]: BR, start

- **Save:** Click on the **Save** button to save the log into a text file on your computer.
- **Clear:** Click on the **Clear** button to clear the log on the screen.
- **Refresh:** Click on the **Refresh** button to refresh the log.

3.2.4 Monitor

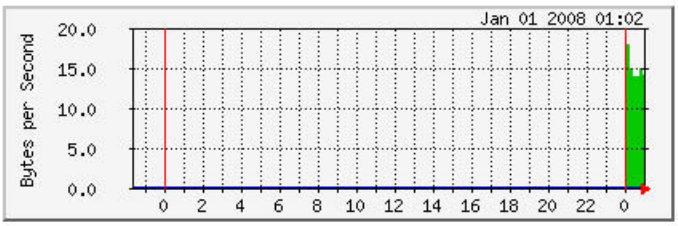
- Click on the **Monitor** link in the navigation drop-down menu. This page displays the transmitted and received packet statistics of the wired (LAN & WAN) and wireless interface. You may change the auto-refresh time by selecting the number of seconds from the drop-down list.

Ethernet Daily Graph (5 Minute Average) Detail



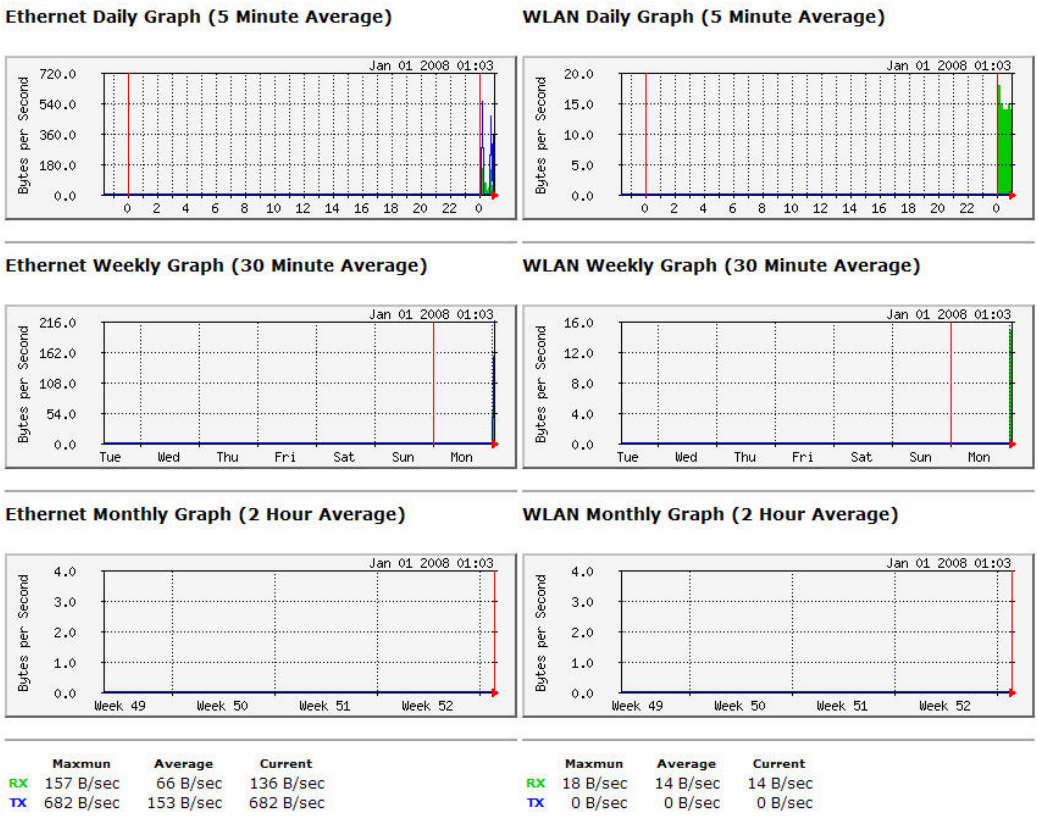
	Maxmun	Average	Current
RX	157 B/sec	66 B/sec	136 B/sec
TX	682 B/sec	153 B/sec	682 B/sec

WLAN Daily Graph (5 Minute Average)



	Maxmun	Average	Current
RX	18 B/sec	14 B/sec	14 B/sec
TX	0 B/sec	0 B/sec	0 B/sec

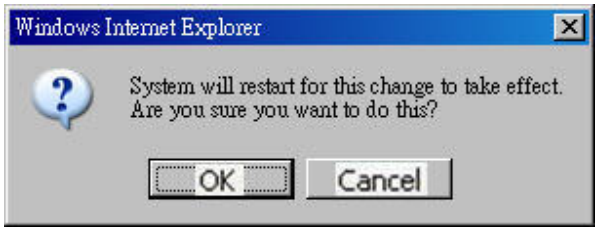
Click Detail to view the history records.


Ethernet Daily Graph (5 Minute Average)
WLAN Daily Graph (5 Minute Average)
Ethernet Weekly Graph (30 Minute Average)
WLAN Weekly Graph (30 Minute Average)
Ethernet Monthly Graph (2 Hour Average)
WLAN Monthly Graph (2 Hour Average)
Bytes per Second
Jan 01 2008 01:03
Tue Wed Thu Fri Sat Sun Mon
Week 49 Week 50 Week 51 Week 52
Maxmun Average Current
RX 157 B/sec 66 B/sec 136 B/sec
TX 682 B/sec 153 B/sec 682 B/sec
RX 18 B/sec 14 B/sec 14 B/sec
TX 0 B/sec 0 B/sec 0 B/sec

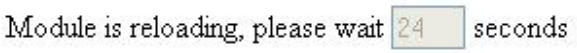
3.2.4.1 Switching between Operating Modes

- Each of the operating modes offers different features. In order to switch the operating mode, select it from the System >> Operation Mode

- A dialog box will appear to notify you that the system will restart in order for the change to take effect. Click on the **OK** button to continue.



- Please wait while the device counts down and restarts into the new operating mode.



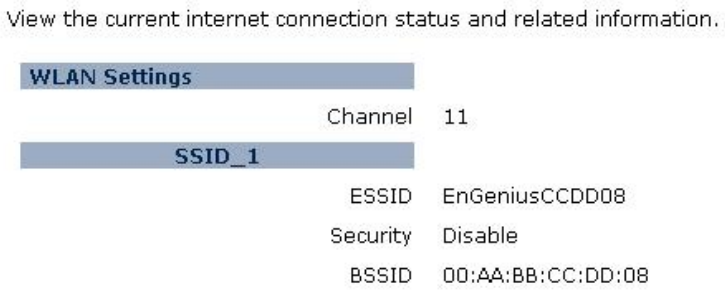
- Each of the operating modes is described in detail in this chapter. Refer to the following sections for each operating mode:
    - 3.2.4.2 Access Point Operating Mode
    - 3.2.4.3 Client Bridge Operating Mode
    - 3.2.4.4 WDS Bridge Operating Mode
    - 3.2.4.5 Repeater Operating Mode

3.2.4.2 Access Point Operating Mode

- In order to configure the device as an Access Point, select **Access Point** from the Operating Mode drop-down list.
- A dialog box will appear to notify you that the system will restart in order for the change to take effect. Click on the **OK** button to continue.
- Please wait while the device counts down and restarts into the new operating mode.
- Once the device has restarted into Access Point mode, you will see a new drop-down menu with nine options which are: Status, Basic, Advanced, Security, Filter, WPS, Client List, VLAN, and WMM. Each of the options is described in detail below.

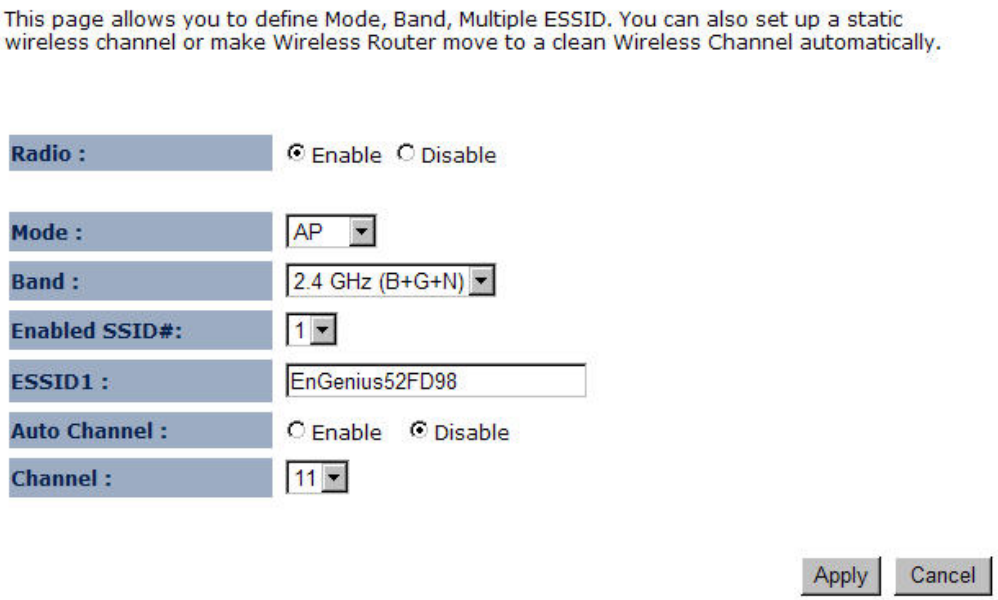
3.2.4.2.1 Status

- Click on the **Status** link under the **Wireless** drop-down menu. This page will display the current wireless settings such as SSID, Channel, Security and BSSID (MAC address)



3.2.4.2.2 Basic

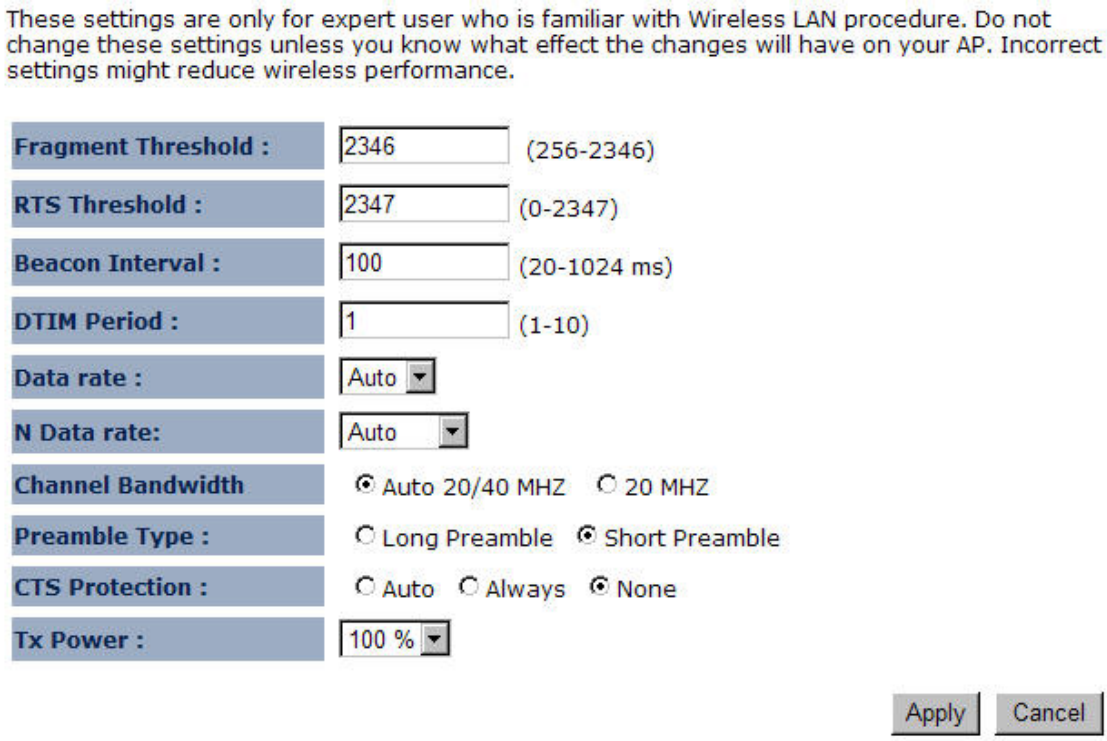
- Click on the **Basic** link under the **Wireless** drop-down menu. This page will display the current wireless settings such as SSID, Channel, Security and BSSID (MAC address).



- **Radio**: Choose to **Enable** or **Disable** the wireless radio.
- **Mode**: This drop-down list is fixed to **AP** as this is the Access Point operating mode.
- **Band**: Select the IEEE 802.11 mode from the drop-down list. For example, if you are sure that the wireless network will be using only IEEE 802.11g clients, then it is recommended to select **802.11g** only instead of **2.4 GHz B+G** which will reduce the performance of the wireless network. You may also select **802.11B+G+N.** If all of the wireless devices you want to connect with this router can connect in the same transmission mode, you can improve performance slightly by choosing the appropriate "Only" mode. If you have some devices that use a different transmission mode, choose the appropriate "Mixed" mode.
- **ESSID#**: This device allows up for four SSIDs, select the **SSID**# that you would like to configure from the drop-down list.
- **ESSID**: The SSID is a unique named shared amongst all the points of the wireless network. The SSID must be identical on all points of the wireless network and cannot exceed 32 characters.
- **Auto Channel**: The device can automatically select the clearest channel in the environment. If auto channel is disabled, then you must select a channel from the drop-down list.
- **Channel**: Select a channel from the drop-down list. The channels available are based on the country's regulation. A wireless network uses specific channels in the wireless spectrum to handle communication between clients. Some channels in your area may have interference from other electronic devices. Choose the clearest channel to help optimize the performance and coverage of your wireless network.
- Click on the **Apply** button to save the changes.

3.2.4.2.3 Advanced

- Click on **Advanced** link under the **Wireless** drop-down menu. This page allows you to configure the fragmentation threshold, RTS threshold, beacon period, transmit power, DTIM Period, etc.



- **Fragment Threshold**: Packets over the specified size will be fragmented in order to improve performance on noisy networks. Specify a value between 256 and 2346. The default value is 2346.
- **RTS Threshold**: Packets over the specified size will use the RTS/CTS mechanism to maintain performance in noisy networks and preventing hidden nodes from degrading the performance. Specify a value between 0 and 2347. The default value is 2347.
- **Beacon Period**: Beacons are packets sent by a wireless Access Point to synchronize wireless devices. Specify a Beacon Period value between 20 and 1024. The default value is set to 100 milliseconds.
- **DTIM Period**: A DTIM is a countdown informing clients of the next window for listening to broadcast and multicast messages. When the wireless Access Point has buffered broadcast or multicast messages for associated clients, it sends the next DTIM with a DTIM Period value. Wireless clients detect the beacons and awaken to receive the broadcast and multicast messages. The default value is 1. Valid settings are between 1 and 10.
- **Data Rate**: You may select a data rate from the drop-down list, however, it is recommended to select **auto**. This is also known as auto-fallback.
- **N Data Rate**: You may select a data rate for 802.11n from the drop-down list, however, it is recommended to select **auto**. This is also known as auto-fallback.

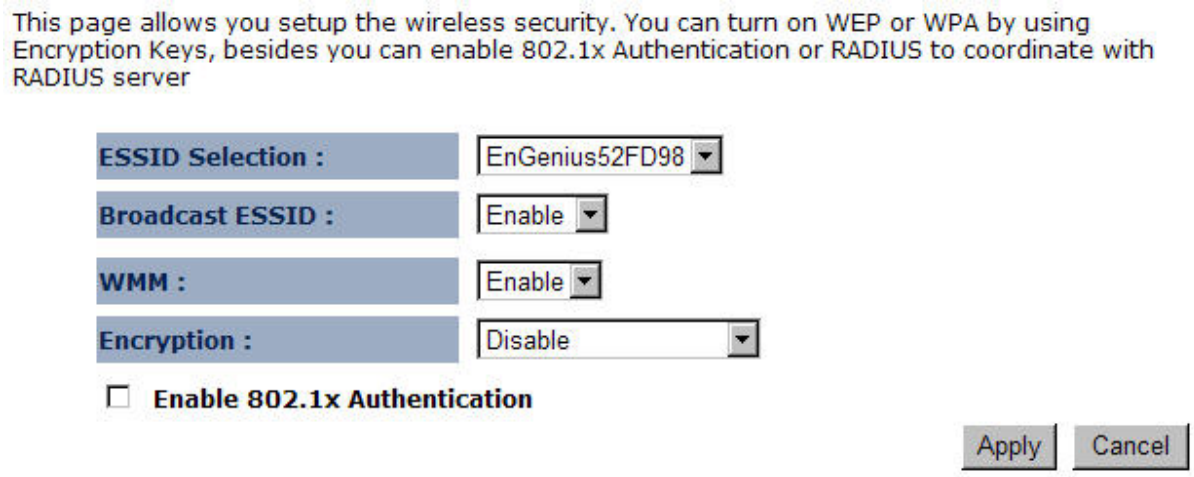
- **Channel Bandwidth**: You may select a channel bandwidth in order to improve the efficiency of the network, however, it is recommended to select **Auto 20/40MHz**. This is also known as auto-fallback.
- **Preamble Type**: Select a short or long preamble. For optimum performance it is recommended to also configure the client device as the same preamble type.
- **CTS Protection**: CTS (Clear to Send) can be always enabled, auto, or disabled. By enabled CTS, the Access Point and clients will wait for a 'clear' signal before transmitting. It is recommended to select **auto**.
- **Tx Power**: You may control the transmit output power of the device by selecting a value from the drop-down list. This feature can be helpful in restricting the coverage area of the wireless network.
- Click on the **Apply** button to save the changes.

3.2.4.2.4 Wireless Security Mode

- Click on the **Security** link under the **Wireless** drop-down menu. To protect your privacy this mode supports several types of wireless security: WEP WPA, WPA2, and 802.1x RADIUS. WEP is the original wireless encryption standard. WPA provides a higher level of security. The following section describes the security configuration in detail.

3.2.4.2.4.1 Security Disabled

- Click on the **Security** link under the **Wireless** drop-down menu.

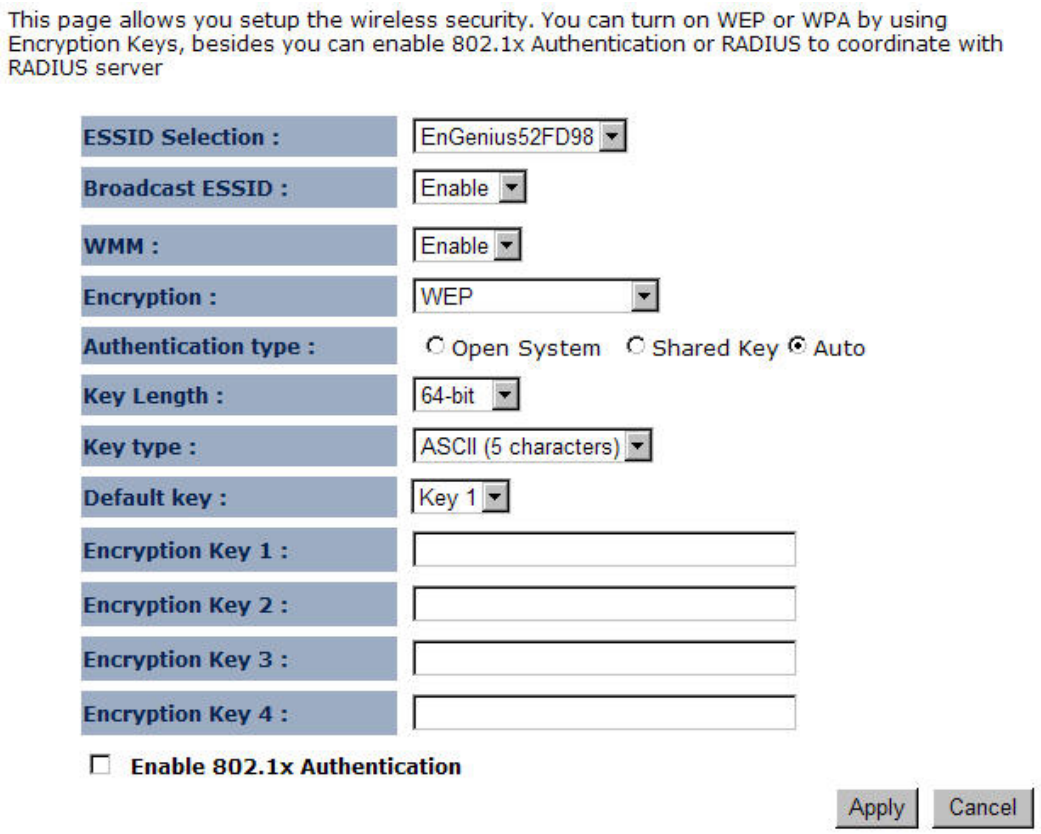

This page allows you setup the wireless security. You can turn on WEP or WPA by using Encryption Keys, besides you can enable 802.1x Authentication or RADIUS to coordinate with RADIUS server
ESSID Selection :
EnGenius52FD98
Broadcast ESSID :
Enable
WMM :
Enable
Encryption :
Disable
Enable 802.1x Authentication
Apply
Cancel

- **ESSID Selection**: As this device supports multiple SSIDs, it is possible to configure a different security mode for each SSID (profile). Select an SSID from the drop-down list.
- **Broadcast SSID**: Select **Enable** or **Disable** from the drop-down list. This is the SSID broadcast feature. When this option is set to Enable, your wireless network name is broadcasted of your signal coverage. If encryption is set to NONE, users will be able to access the AP without authentication. When this is disabled, you must enter the Wireless Network Name (SSID) on the client manually to connect to the network.
- **WMM**: Choose to **Enable** or **Disable** WMM. This is the Quality of Service (QoS) feature for prioritizing voice and video applications. This option can be further configured in **WMM** under the **Wireless** drop-down menu.

- **Encryption**: Select **Disable** from the drop-down list.
- **Enable 802.1x Authentication**: Place a check in this box if you would like to use RADIUS authentication. This option works with a RADIUS Server to authenticate wireless clients. Wireless clients should have established the necessary credentials before attempting to authenticate to the Server through this Gateway. Furthermore, it may be necessary to configure the RADIUS Server to allow this Gateway to authenticate users. You will then be required to specify the RADIUS Server's IP address, port, and password.
- Click on the **Apply** button to save the changes.

3.2.4.2.4.2 WEP (Wired Equivalent Privacy)

- Click on the **Security** link under the **Wireless** drop-down menu.
- WEP is an acronym for Wired Equivalent Privacy, and is a security protocol that provides the same level of security for wireless networks as for a wired network.
- WEP is less secure as compares to WPA encryption. To gain access to a WEP network, you must know the key. The key is a string of characters that you use for password. When using WEP, you must determine the level of encryption.
- The type of encryption determines the key length. 128-bit encryption requires a longer key than 64-bit encryption. Keys are defined by entering in a string in HEX (hexadecimal - using characters 0-9, A-F) or ASCII (American Standard Code for Information Interchange - alphanumeric characters) format. ASCII format is provided so you can enter a string that is easier to remember. The ASCII string is converted to HEX for use over the network. Four keys can be defined so that you can change keys easily. A default key is automatically generated when WEP is enabled.



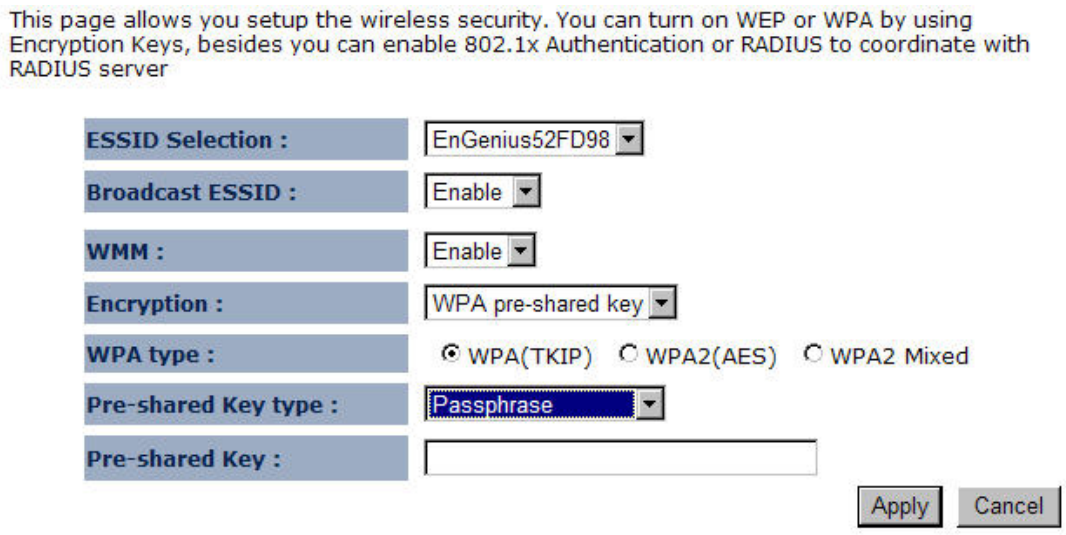
- **ESSID Selection**: As this device supports multiple SSIDs, it is possible to configure a different security mode for each SSID (profile). Select an SSID from the drop-down list.
- **Broadcast SSID**: Select **Enable** or **Disable** from the drop-down list. This is the SSID broadcast feature. When this option is set to Enable, your wireless network name is broadcast to anyone within the range of your signal. If you're not using encryption then they could connect to your network. When this is disabled, you must enter the Wireless Network Name (SSID) on the client manually to connect to the network.
- **WMM**: Choose to **Enable** or **Disable** WMM. This is the Quality of Service (QoS) feature for prioritizing voice and video applications. This option can be further configured in **WMM** under the **Wireless** drop-down menu.
- **Encryption**: Select **WEP** from the drop-down list.
- **Authentication Type:** Select **Open System**, **Shared Key, or auto**. Authentication method from the drop-down list. An open system allows any client to authenticate as long as it conforms to any MAC address filter policies that may have been set. All authentication packets are transmitted without encryption. Shared Key sends an unencrypted challenge text string to any device attempting to communicate with the AP. The device requesting authentication encrypts the challenge text and sends it back to the access point. If the challenge text is encrypted correctly, the access point allows the requesting device to authenticate. It is recommended to select Auto if you are not sure which authentication type is used.
- **Key Length**: Select a **64-bit** or **128-bit** WEP key length from the drop-down list.
- **Key Type**: Select a key type from the drop-down list. 128-bit encryption requires a longer key than 64-bit encryption. Keys are defined by entering in a string in **HEX** (hexadecimal - using characters 0-9, A-F) or **ASCII** (American Standard Code for

Information Interchange - alphanumeric characters) format. ASCII format is provided so you can enter a string that is easier to remember.

- **Default Key**: You may choose one of your 4 different WEP keys from below.
- **Encryption Key 1-4:** You may enter four different WEP keys.
- **Enable 802.1x Authentication**: Place a check in this box if you would like to use RADIUS authentication. This option works with a RADIUS Server to authenticate wireless clients. Wireless clients should have established the necessary credentials before attempting to authenticate to the Server through this Gateway. Furthermore, it may be necessary to configure the RADIUS Server to allow this Gateway to authenticate users. You will then be required to specify the RADIUS Server's IP address, port, and password.
- Click on the **Apply** button to save the changes.

3.2.4.2.4.3 WPA (Wi-Fi Protected Access) / Pre-shared Key

- Click on the **Security** link under the **Wireless** drop-down menu.
- WPA (Wi-Fi Protected Access) is designed to improve upon the security features of WEP (Wired Equivalent Privacy). The technology is designed to work with existing Wi-Fi products that have been enabled with WEP. WPA provides improved data encryption through the Temporal Integrity Protocol (TKIP), which scrambles the keys using a hashing algorithm and by adding an integrity checking feature which makes sure that keys haven't been tampered with.

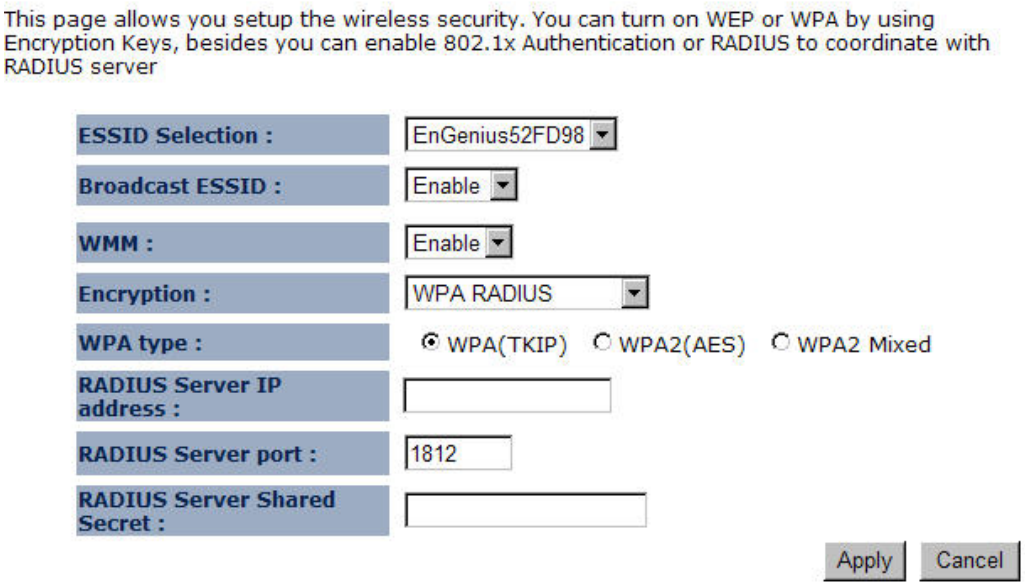


- **ESSID Selection**: As this device supports multiple SSIDs, it is possible to configure a different security mode for each SSID (profile). Select an SSID from the drop-down list.
- **Broadcast SSID**: Select **Enable** or **Disable** from the drop-down list. This is the SSID broadcast feature. When this option is set to Enable, your wireless network name is broadcast to anyone within the range of your signal. If you're not using encryption then they could connect to your network. When this is disabled, you must enter the Wireless Network Name (SSID) on the client manually to connect to the network.

- **WMM**: Choose to **Enable** or **Disable** WMM. This is the Quality of Service (QoS) feature for prioritizing voice and video applications. This option can be further configured in **WMM** under the **Wireless** drop-down menu.
- **Encryption**: Select **WPA pre-shared key** from the drop-down list.
- **WPA Type**: Select TKIP, AES, or WPA2 Mixed. The encryption algorithm used to secure the data communication. **TKIP** (Temporal Key Integrity Protocol) provides per-packet key generation and is based on WEP. **AES** (Advanced Encryption Standard) is a very secure block based encryption. Note that, if the bridge uses the AES option, the bridge can associate with the access point only if the access point is also set to use only AES.
- **Pre-shared Key Type:**: The Key Type can be **passphrase** or **Hex** format.
- **Pre-Shared Key**: The key is entered as a pass-phrase of up to 63 alphanumeric characters in ASCII (American Standard Code for Information Interchange) format at both ends of the wireless connection. It cannot be shorter than eight characters, although for proper security it needs to be of ample length and should not be a commonly known phrase. This phrase is used to generate session keys that are unique for each wireless client.
- Click on the **Apply** button to save the changes.

3.2.4.2.4.4 WPA RADIUS (802.1x)

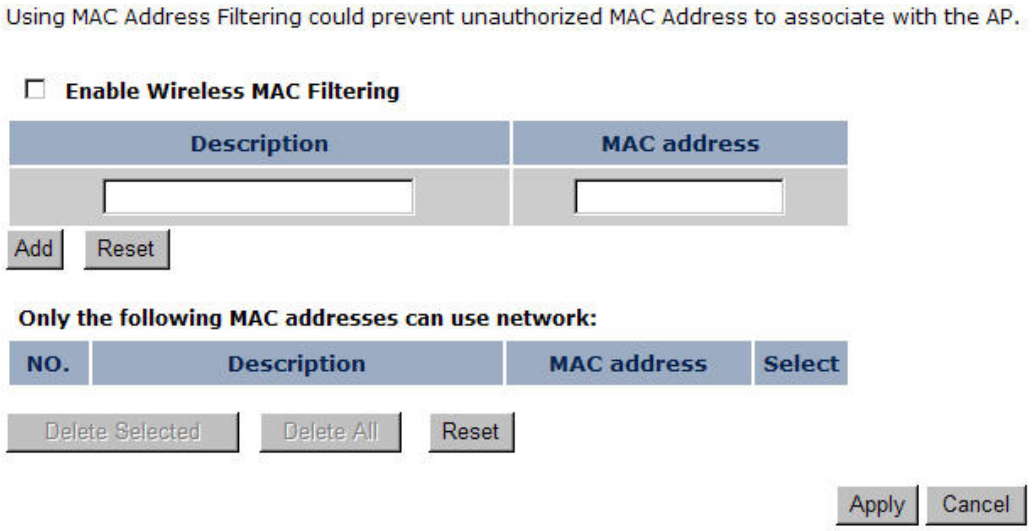
- Click on the **Security** link under the **Wireless** drop-down menu.
- WPA encryption. WPA (Wi-Fi Protected Access) was designed to improve upon the security features of WEP (Wired Equivalent Privacy). The technology is designed to work with existing Wi-Fi products that have been enabled with WEP. WPA provides improved data encryption through the Temporal Integrity Protocol (TKIP), which scrambles the keys using a hashing algorithm and by adding an integrity checking feature which makes sure that keys haven't been tampered with.
- This option works with a RADIUS Server to authenticate wireless clients. Wireless clients should have established the necessary credentials before attempting to authenticate to the Server through this Gateway. Furthermore, it may be necessary to configure the RADIUS Server to allow this Gateway to authenticate users.



- **ESSID Selection**: As this device supports multiple SSIDs, it is possible to configure a different security mode for each SSID (profile). Select an SSID from the drop-down list.
- **Broadcast SSID**: Select **Enable** or **Disable** from the drop-down list. This is the SSID broadcast feature. When this option is set to Enable, your wireless network name is broadcast to anyone within the range of your signal. If you're not using encryption then they could connect to your network. When this is disabled, you must enter the Wireless Network Name (SSID) on the client manually to connect to the network.
- **WMM**: Choose to **Enable** or **Disable** WMM. This is the Quality of Service (QoS) feature for prioritizing voice and video applications. This option can be further configured in **WMM** under the **Wireless** drop-down menu.
- **Encryption**: Select **WPA RADIUS** from the drop-down list.
- **WPA Type**: Select TKIP, AES, or WPA2 Mixed. The encryption algorithm used to secure the data communication. **TKIP** (Temporal Key Integrity Protocol) provides per-packet key generation and is based on WEP. **AES** (Advanced Encryption Standard) is a very secure block based encryption. Note that, if the bridge uses the AES option, the bridge can associate with the access point only if the access point is also set to use only AES.
- **RADIUS Server IP Address**: Specify the IP address of the RADIUS server.
- **RADIUS Server Port**: Specify the port number of the RADIUS server, the default port is 1812.
- **RADIUS Server Password**: Specify the pass-phrase that is matched on the RADIUS Server.
- Click on the **Apply** button to save the changes.

3.2.4.2.5 Filter

You will be able to block out connections from unauthorized MAC Address by setting filter policy.



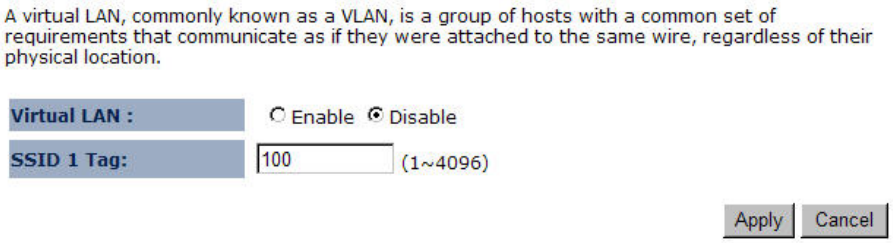
- Check on the **Enable Wireless MAC Filtering**
- Type in Description as a note for your own reference
- Enter the MAC address that you allow for accessing to your device
- Press Add to apply the policy
- Click Apply for the setting to take effect

3.2.4.2.6 Client List

- Click on the **Client List** link under the **Wireless** drop-down menu. This page displays the list of Clients that are associated to the Access Point.
- The MAC address and signal strength for each client is displayed. Click on the **Refresh** button to refresh the client list

3.2.4.2.7 VLAN

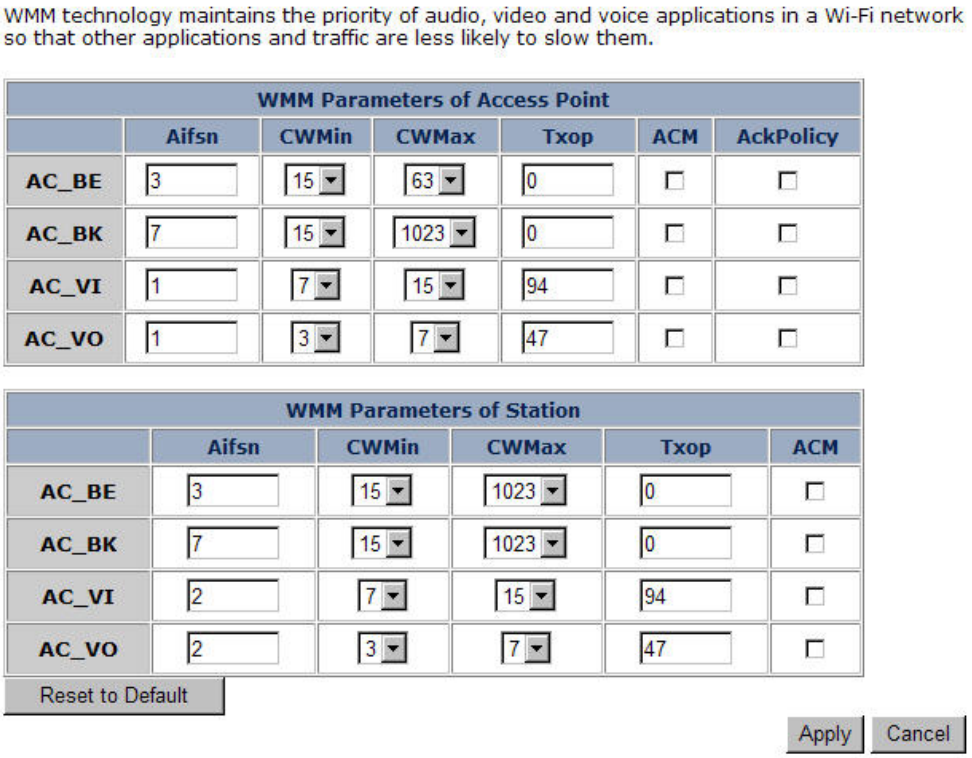
- Click on the **VLAN** link under the **Wireless** drop-down menu. A VLAN (Virtual LAN) is a group of hosts with a common set of requirements that communicate as if they were attached to the same wire, regardless of their physical location.

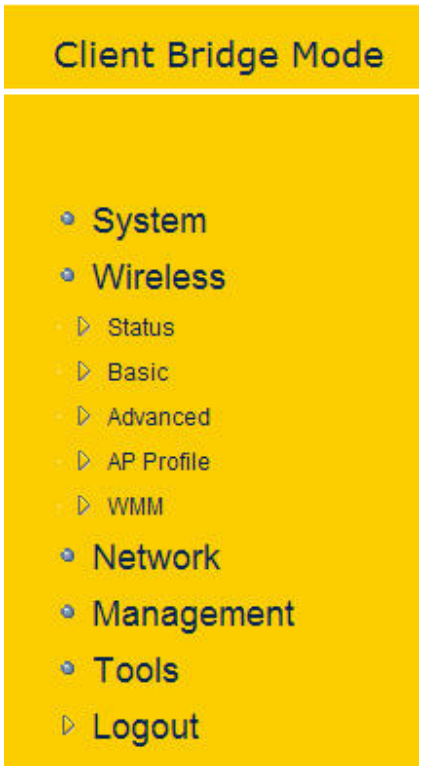

A virtual LAN, commonly known as a VLAN, is a group of hosts with a common set of requirements that communicate as if they were attached to the same wire, regardless of their physical location.
Virtual LAN :
Enable
Disable
SSID 1 Tag:
100
(1~4096)
Apply
Cancel

- **Virtual LAN**: Choose to Enable or Disable the VLAN features.
- **SSID1 Tag**: Specify the VLAN tag.
- Click on the **Apply** button to save the changes.

3.2.4.2.8 WMM (Wireless Multimedia)

- Click on the **WMM** link under the **Wireless** drop-down menu. WMM is Quality of Service (QoS) for wireless and ensures that voice and video applications get priority in order to run smoothly.
- Specify the priority and then click on the **Apply** button.


WMM technology maintains the priority of audio, video and voice applications in a Wi-Fi network so that other applications and traffic are less likely to slow them.
WMM Parameters of Access Point
Aifsn CWMin CWMax Txop ACM AckPolicy
AC_BE 3 15 63 0
AC_BK 7 15 1023 0
AC_VI 1 7 15 94
AC_VO 1 3 7 47
WMM Parameters of Station
Aifsn CWMin CWMax Txop ACM
AC_BE 3 15 1023 0
AC_BK 7 15 1023 0
AC_VI 2 7 15 94
AC_VO 2 3 7 47
Reset to Default
Apply
Cancel

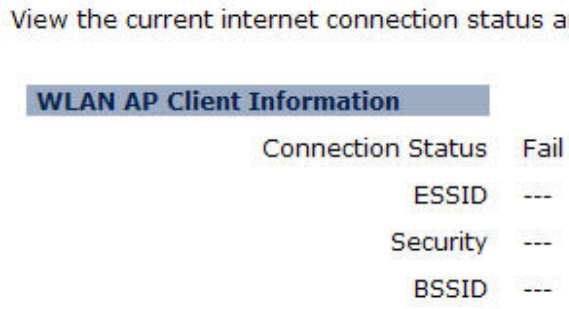


3.2.4.3 Client Bridge Operating Mode

- In order to configure the device as an Access Point, select **Client Bridge** from the Operating Mode drop-down list.
- A dialog box will appear to notify you that the system will restart in order for the change to take effect. Click on the **OK** button to continue.
- Please wait while the device counts down and restarts into the new operating mode.
- Once the device has restarted into Client Bridge mode, you will see a new drop-down menu with fice options which are: Status, Basic, Advanced, AP Profile, and WMM. Each of the options is described in detail below.

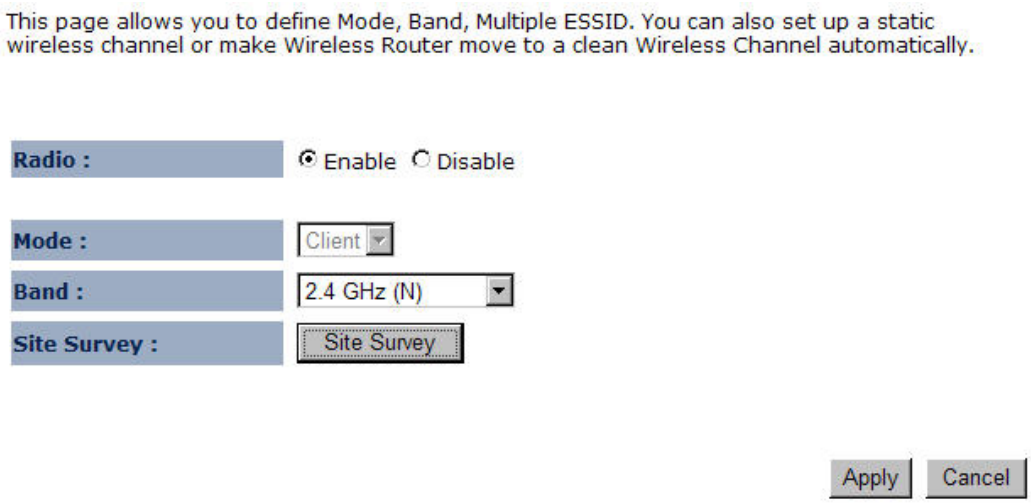
3.2.4.3.1 Status

- Click on the **Status** link under the **Wireless** drop-down menu. This page will display the current wireless settings such as SSID, Channel, Security and BSSID (MAC address)

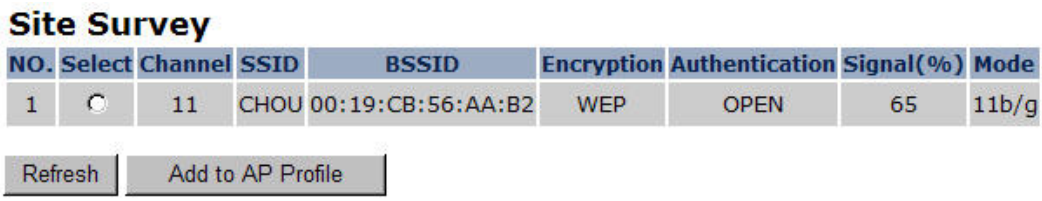


3.2.4.3.2 Basic

- Click on the **Basic** link under the **Wireless** drop-down menu. This page will display the current wireless settings such as SSID, Channel, Security and BSSID (MAC address).


This page allows you to define Mode, Band, Multiple ESSID. You can also set up a static wireless channel or make Wireless Router move to a clean Wireless Channel automatically.
Radio :
Enable
Disable
Mode :
Client
Band :
2.4 GHz (N)
Site Survey :
Site Survey
Apply
Cancel

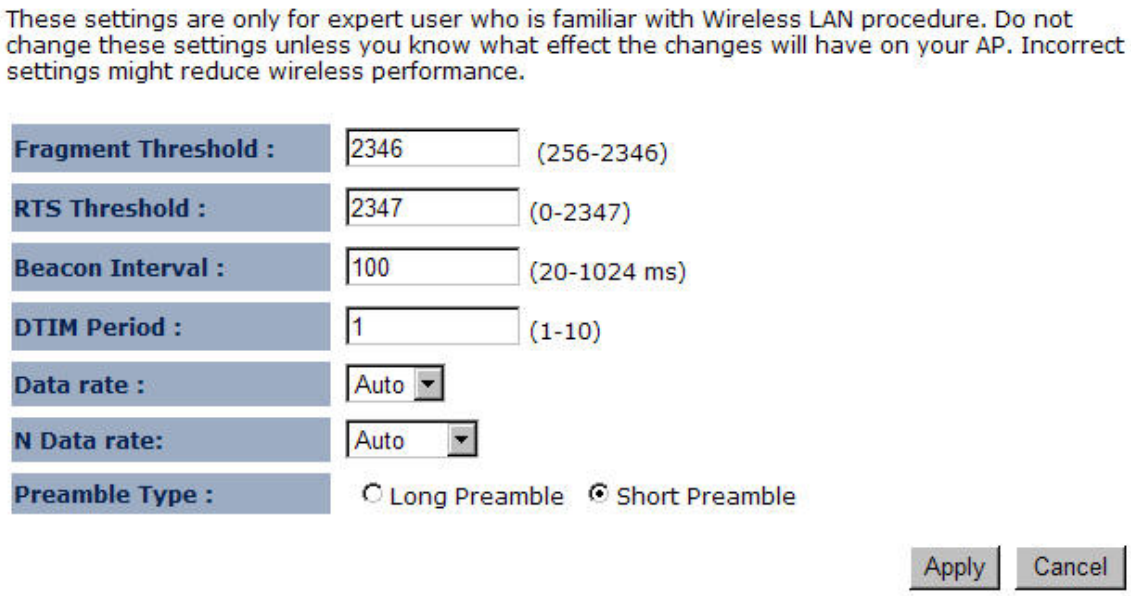
- **Radio**: Choose to **Enable** or **Disable** the wireless radio.
- **Mode**: This drop-down list is fixed to **Client** as this is the Client Bridge operating mode.
- **Band**: Select the IEEE 802.11 mode from the drop-down list. For example, if you are sure that the wireless network will be using only IEEE 802.11g clients, then it is recommended to select **802.11g** only instead of **2.4 GHz B+G** which will reduce the performance of the wireless network. You may also select **802.11B+G+N.** If all of the wireless devices you want to connect with this router can connect in the same transmission mode, you can improve performance slightly by choosing the appropriate "Only" mode. If you have some devices that use a different transmission mode, choose the appropriate "Mixed" mode.
- **Site Survey**: Click on the Site Survey button to view a list of Access Points in the area. The Site Survey page displays information about devices within the 802.11b/g/n frequency. Information such as channel, SSID, BSSID, encryption, authentication, signal strength, and operating mode are displayed. Select the desired device and then click on the **Add to AP Profile** button.


Site Survey
NO. Select Channel SSID BSSID Encryption Authentication Signal(%) Mode
1 11 CHOU 00:19:CB:56:AA:B2 WEP OPEN 65 11b/g
Refresh
Add to AP Profile

- **SSID**: The SSID is a unique named shared amongst all the points of the wireless network. The SSID must be identical on all points of the wireless network and cannot exceed 32 characters.
- **Status:** Displays the current status of the device.
- **Channel**: The channels available are based on the country's regulation. A wireless network uses specific channels in the wireless spectrum to handle communication between clients. Some channels in your area may have interference from other electronic devices.
- Click on the **Apply** button to save the changes.

3.2.4.3.3 Advanced

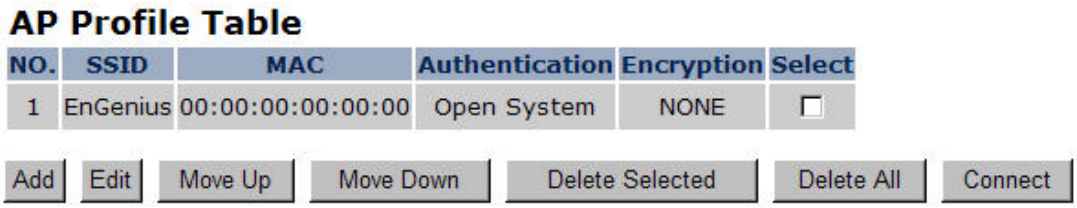
- Click on **Advanced** link under the **Wireless** drop-down menu. This page allows you to configure the fragmentation threshold, RTS threshold, beacon period, transmit power, DTIM Period, etc.



- **Fragment Threshold**: Packets over the specified size will be fragmented in order to improve performance on noisy networks. Specify a value between 256 and 2346. The default value is 2346.
- **RTS Threshold**: Packets over the specified size will use the RTS/CTS mechanism to maintain performance in noisy networks and preventing hidden nodes from degrading the performance. Specify a value between 0 and 2347. The default value is 2347.
- **Beacon Period**: Beacons are packets sent by a wireless Access Point to synchronize wireless devices. Specify a Beacon Period value between 20 and 1024. The default value is set to 100 milliseconds.
- **DTIM Period**: A DTIM is a countdown informing clients of the next window for listening to broadcast and multicast messages. When the wireless Access Point has buffered broadcast or multicast messages for associated clients, it sends the next DTIM with a DTIM Period value. Wireless clients detect the beacons and awaken to receive the broadcast and multicast messages. The default value is 1. Valid settings are between 1 and 10.
- **Data Rate**: You may select a data rate from the drop-down list, however, it is recommended to select **auto**. This is also known as auto-fallback.
- **N Data Rate**: You may select a data rate for 802.11n from the drop-down list, however, it is recommended to select **auto**. This is also known as auto-fallback.
- **Preamble Type**: Select a short or long preamble. For optimum performance it is recommended to also configure the client device as the same preamble type.
- Click on the **Apply** button to save the changes.

3.2.4.3.4 AP Profile

- Click on the **AP Profile** link under the **Wireless** drop-down menu.
- This page allows you to configure the profile of the Client Bridge including Security Setting exactly the same as the Access Point.



3.2.4.3.4.1 Manage AP Profile

1. Press Add/Edit to add/modify the SSID(s) of your device.
2. Setting Encryption type from Encryption dropdown list. (See 3.2.4.2.4.2 to 3.2.4.2.4.4)
3. Press Save to save your setting.

This page allows you setup the wireless security. You can turn on WEP or WPA by using Encryption Keys, besides you can enable 802.1x Authentication or RADIUS to coordinate with RADIUS server
AP Profile Settings
Network Name (SSID) :
Encryption :
Disable
Save

4. Check one of the SSID in the table to **Move Up** or **Move Down** the display order
5. **Delete Selected** to delete the SSID on check.
6. **Delete All** to delete all SSID from the table
7. **Connect** to configure your device using the SSID on check

3.2.4.3.5 WMM (Wireless Multimedia)

- Click on the **WMM** link under the **Wireless** drop-down menu. WMM is Quality of Service (QoS) for wireless and ensures that voice and video applications get priority in order to run smoothly.
- Specify the priority and then click on the **Apply** button.

WMM technology maintains the priority of audio, video and voice applications in a Wi-Fi network so that other applications and traffic are less likely to slow them.

WMM Parameters of Access Point						
	Aifsn	CWMin	CWMax	Txop	ACM	AckPolicy
AC_BE	3	15	63	0	☐	☐
AC_BK	7	15	1023	0	☐	☐
AC_VI	1	7	15	94	☐	☐
AC_VO	1	3	7	47	☐	☐

WMM Parameters of Station					
	Aifsn	CWMin	CWMax	Txop	ACM
AC_BE	3	15	1023	0	☐
AC_BK	7	15	1023	0	☐
AC_VI	2	7	15	94	☐
AC_VO	2	3	7	47	☐

Reset to Default

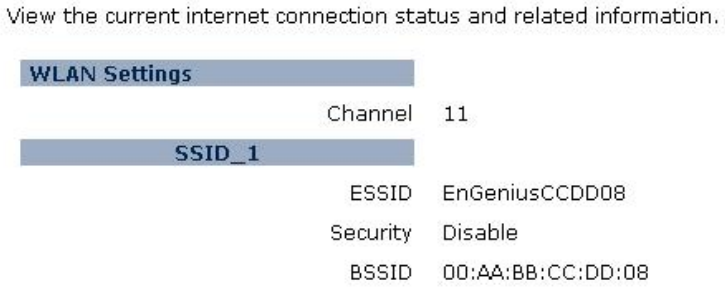
Apply Cancel

3.2.4.4 WDS Operating Mode

- In order to configure the device as an Access Point, select **WDS** from the Operating Mode drop-down list.
- A dialog box will appear to notify you that the system will restart in order for the change to take effect. Click on the **OK** button to continue.
- Please wait while the device counts down and restarts into the new operating mode.
- Once the device has restarted into WDS mode, you will see a new drop-down menu with four options which are: Status, Basic, Advanced, and WMM. Each of the options is described in detail below.

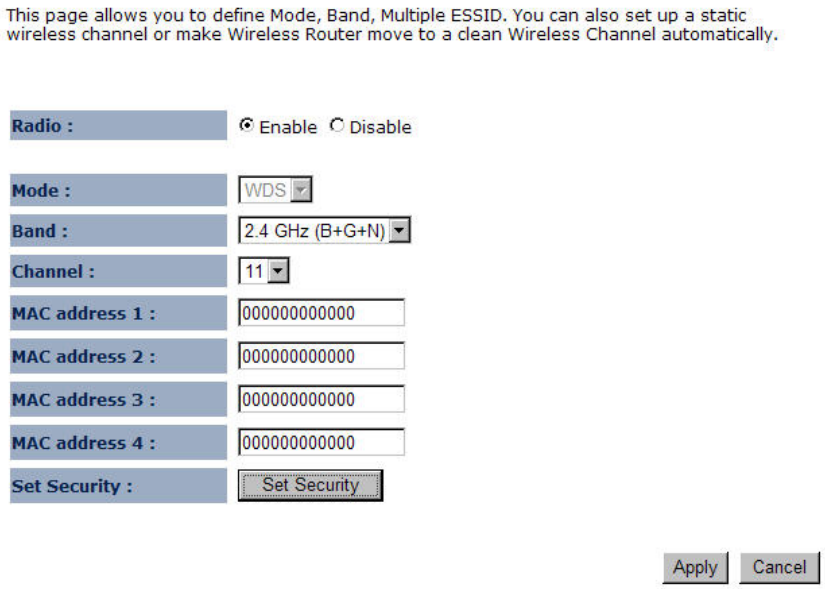
3.2.4.4.1 Status

- Click on the **Status** link under the **Wireless** drop-down menu. This page will display the current wireless settings such as SSID, Channel, Security and BSSID (MAC address)



3.2.4.4.2 Basic

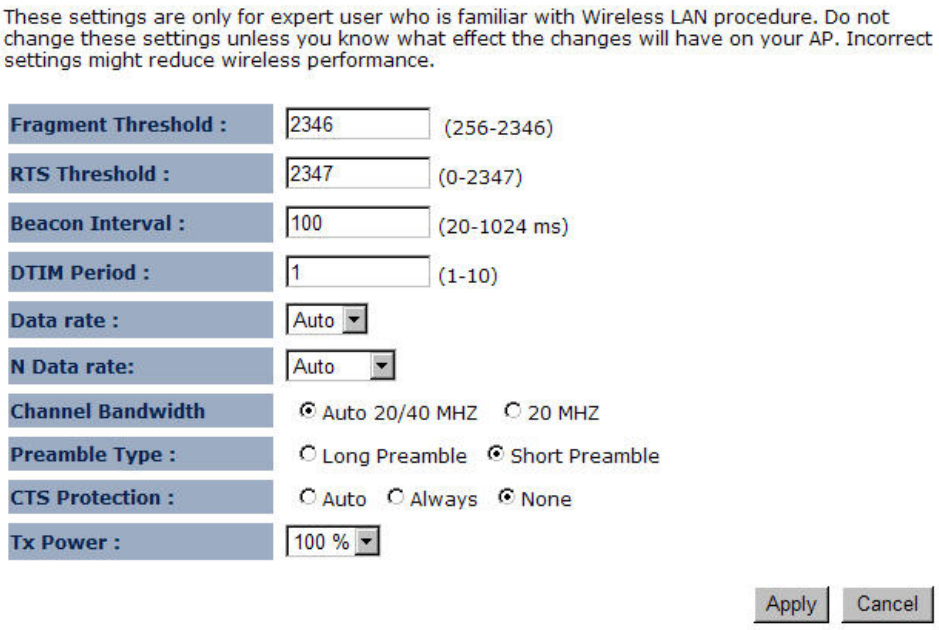
- Click on the **Basic** link under the **Wireless** drop-down menu. This page will display the current wireless settings such as SSID, Channel, Security and BSSID (MAC address).



- **Radio**: Choose to **Enable** or **Disable** the wireless radio.
- **Mode**: This drop-down list is fixed to **WDS** as this is the Wireless Distribution operating mode.
- **Band**: Select the IEEE 802.11 mode from the drop-down list. For example, if you are sure that the wireless network will be using only IEEE 802.11g clients, then it is recommended to select **802.11g** only instead of **2.4 GHz B+G** which will reduce the performance of the wireless network. You may also select **802.11B+G+N.** If all of the wireless devices you want to connect with this router can connect in the same transmission mode, you can improve performance slightly by choosing the appropriate "Only" mode. If you have some devices that use a different transmission mode, choose the appropriate "Mixed" mode.
- **Channel**: Select a channel from the drop-down list. The channels available are based on the country's regulation. A wireless network uses specific channels in the wireless spectrum to handle communication between clients. Some channels in your area may have interference from other electronic devices. Choose the clearest channel to help optimize the performance and coverage of your wireless network.
- **MAC Address** #: Specify the MAC address (BSSID) of up to four devices within the WDS.
- **Set Security**: Setting data encryption type. (See 3.2.4.2.4.2 to 3.2.4.2.4.4)
- Click on the **Apply** button to save the changes.

3.2.4.4.3 Advanced

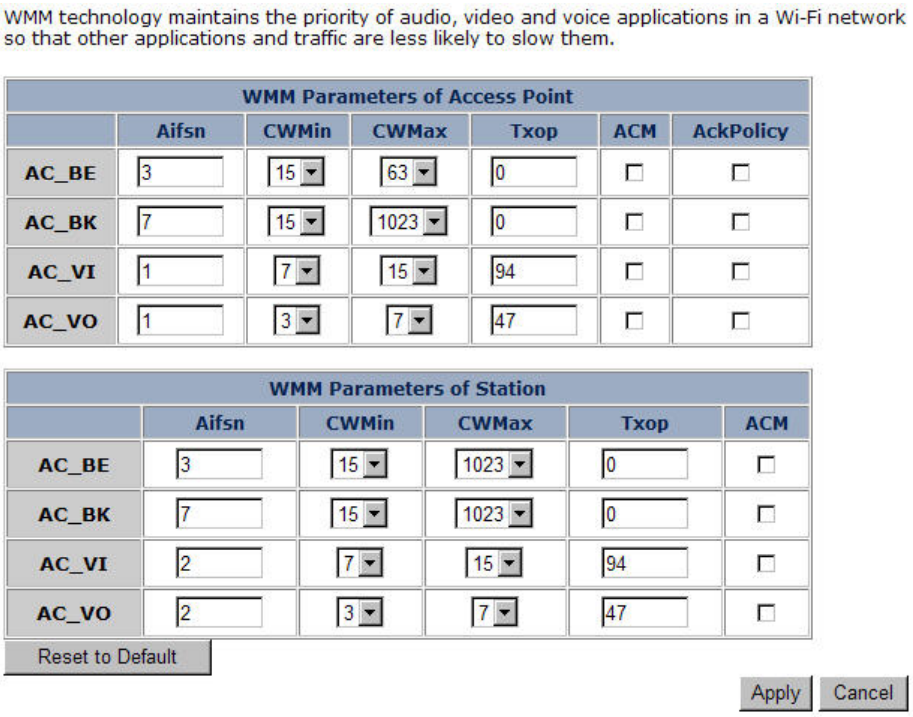
- Click on **Advanced** link under the **Wireless** drop-down menu. This page allows you to configure the fragmentation threshold, RTS threshold, beacon period, transmit power, DTIM Period, etc.


These settings are only for expert user who is familiar with Wireless LAN procedure. Do not change these settings unless you know what effect the changes will have on your AP. Incorrect settings might reduce wireless performance.
Fragment Threshold : 2346 (256-2346)
RTS Threshold : 2347 (0-2347)
Beacon Interval : 100 (20-1024 ms)
DTIM Period : 1 (1-10)
Data rate : Auto
N Data rate: Auto
Channel Bandwidth Auto 20/40 MHZ 20 MHZ
Preamble Type : Long Preamble Short Preamble
CTS Protection : Auto Always None
Tx Power : 100 %
Apply Cancel

- **Fragment Threshold**: Packets over the specified size will be fragmented in order to improve performance on noisy networks. Specify a value between 256 and 2346. The default value is 2346.
- **RTS Threshold**: Packets over the specified size will use the RTS/CTS mechanism to maintain performance in noisy networks and preventing hidden nodes from degrading the performance. Specify a value between 0 and 2347. The default value is 2347.
- **Beacon Interval**: Beacons are packets sent by a wireless Access Point to synchronize wireless devices. Specify a Beacon Period value between 20 and 1024. The default value is set to 100 milliseconds.
- **DTIM Period**: A DTIM is a countdown informing clients of the next window for listening to broadcast and multicast messages. When the wireless Access Point has buffered broadcast or multicast messages for associated clients, it sends the next DTIM with a DTIM Period value. Wireless clients detect the beacons and awaken to receive the broadcast and multicast messages. The default value is 1. Valid settings are between 1 and 10.
- **Data Rate**: You may select a data rate from the drop-down list, however, it is recommended to select **auto**. This is also known as auto-fallback.
- **N Data Rate**: You may select a data rate for 802.11n from the drop-down list, however, it is recommended to select **auto**. This is also known as auto-fallback.
- **Channel Bandwidth**: You may select a channel bandwidth in order to improve the efficiency of the network, however, it is recommended to select **Auto 20/40MHz**. This is also known as auto-fallback.
- **Preamble Type**: Select a short or long preamble. For optimum performance it is recommended to also configure the client device as the same preamble type.
- **CTS Protection**: CTS (Clear to Send) can be always enabled, auto, or disabled. By enabled CTS, the Access Point and clients will wait for a 'clear' signal before transmitting. It is recommended to select **auto**.
- **Tx Power**: You may control the transmit output power of the device by selecting a value from the drop-down list. This feature can be helpful in restricting the coverage area of the wireless network.
- Click on the **Apply** button to save the changes.

3.2.4.4.4 WMM (Wireless Multimedia)

- Click on the **WMM** link under the **Wireless** drop-down menu. WMM is Quality of Service (QoS) for wireless and ensures that voice and video applications get priority in order to run smoothly.
- Specify the priority and then click on the **Apply** button.

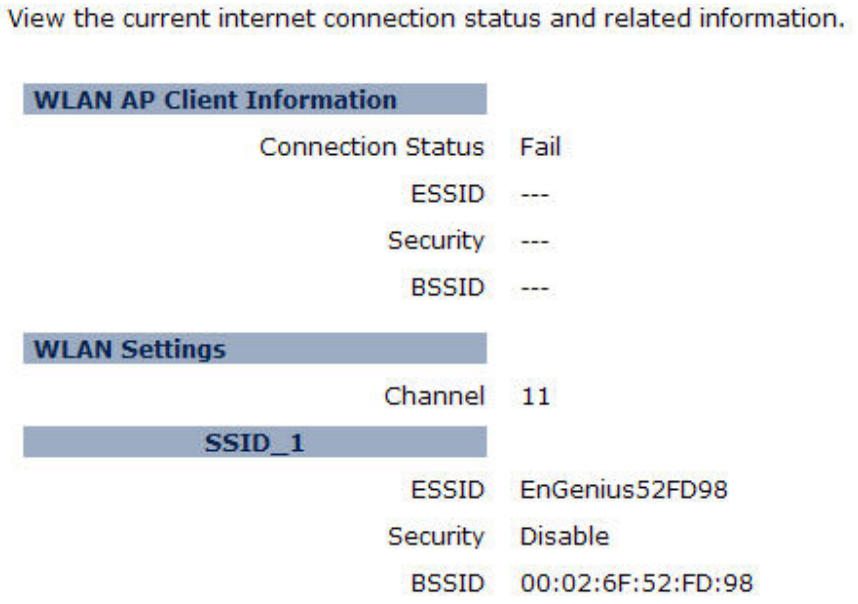

WMM technology maintains the priority of audio, video and voice applications in a Wi-Fi network so that other applications and traffic are less likely to slow them.
WMM Parameters of Access Point
Aifsn CWMin CWMax Txop ACM AckPolicy
AC_BE 3 15 63 0
AC_BK 7 15 1023 0
AC_VI 1 7 15 94
AC_VO 1 3 7 47
WMM Parameters of Station
Aifsn CWMin CWMax Txop ACM
AC_BE 3 15 1023 0
AC_BK 7 15 1023 0
AC_VI 2 7 15 94
AC_VO 2 3 7 47
Reset to Default
Apply
Cancel

3.2.4.5 Repeater Operating Mode

- In order to configure the device as an Access Point, select **Repeater** from the Operating Mode drop-down list.
- A dialog box will appear to notify you that the system will restart in order for the change to take effect. Click on the **OK** button to continue.
- Please wait while the device counts down and restarts into the new operating mode.
- Once the device has restarted into Repeater mode, you will see a new drop-down menu with eight options which are: Status, Basic, Advanced, Security, Filter, WPS, Client List, and WMM. Each of the options is described in detail below.

3.2.4.5.1 Status

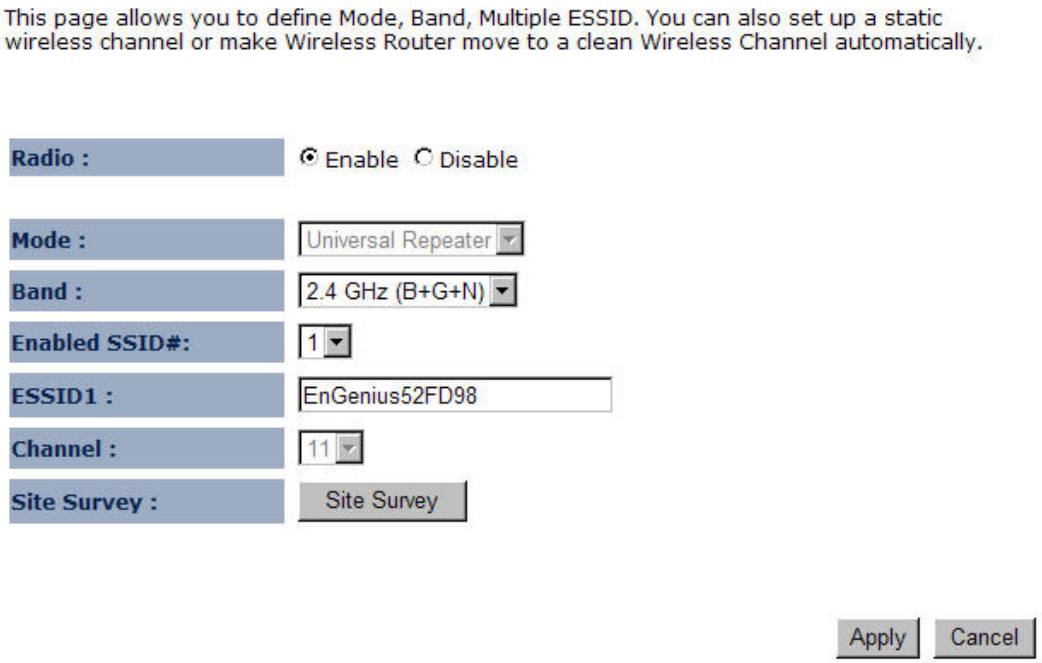
- Click on the **Status** link under the **Wireless** drop-down menu. This page will display the current wireless settings such as SSID, Channel, Security and BSSID (MAC address)



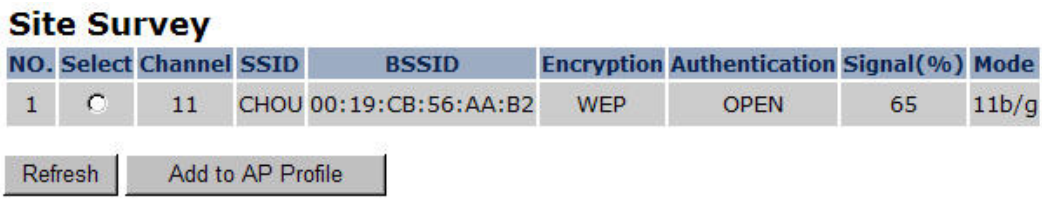
3.2.4.5.2 Basic

- Click on the **Basic** link under the **Wireless** drop-down menu. This page will display the current wireless settings such as SSID, Channel, Security and BSSID (MAC address).

- **Radio**: Choose to **Enable** or **Disable** the wireless radio.
- **Mode**: This drop-down list is fixed to **WDS** as this is the Wireless Distribution operating mode.
- **Band**: Select the IEEE 802.11 mode from the drop-down list. For example, if you are sure that the wireless network will be using only IEEE 802.11g clients, then it is recommended to select **802.11g** only instead of **2.4 GHz B+G** which will reduce the performance of the wireless network. You may also select **802.11B+G+N.** If all of the wireless devices you want to connect with this router can connect in the same transmission mode, you can improve performance slightly by choosing the appropriate "Only" mode. If you have some devices that use a different transmission mode, choose the appropriate "Mixed" mode.
- **ESSID#**: This device allows up for four SSIDs, select the **SSID**# that you would like to configure from the drop-down list.
- **ESSID**: The SSID is a unique named shared amongst all the points of the wireless network. The SSID must be identical on all points of the wireless network and cannot exceed 32 characters.
- **Channel:** Select the channel as you wish to use for your device
- Click on the **Apply** button to save the changes.



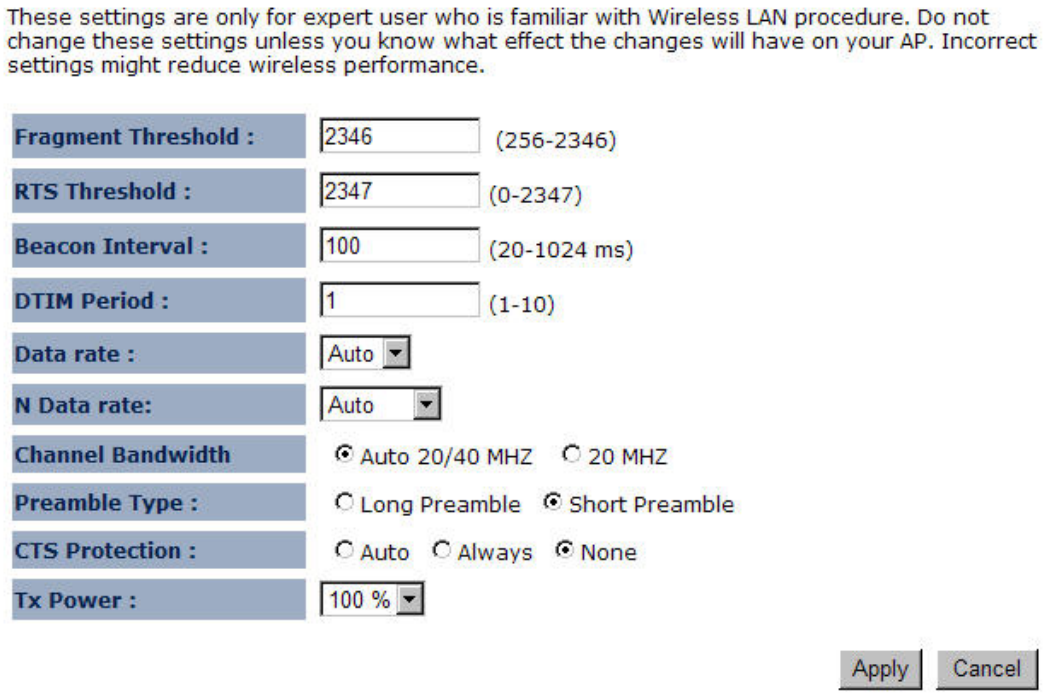
- **Site Survey**: Click on the Site Survey button to view a list of Access Points in the area. The Site Survey page displays information about devices within the 802.11b/g/n frequency. Information such as channel, SSID, BSSID, encryption, authentication, signal strength, and operating mode are displayed. Select the desired device and then click on the **Add to AP Profile** button.


Site Survey
NO. Select Channel SSID BSSID Encryption Authentication Signal(%) Mode
1 11 CHOU 00:19:CB:56:AA:B2 WEP OPEN 65 11b/g
Refresh
Add to AP Profile

- **SSID**: The SSID is a unique named shared amongst all the points of the wireless network. The SSID must be identical on all points of the wireless network and cannot exceed 32 characters.
- **Status:** Displays the current status of the device.
- **Channel**: The channels available are based on the country's regulation. A wireless network uses specific channels in the wireless spectrum to handle communication between clients. Some channels in your area may have interference from other electronic devices.
- Click on the **Apply** button to save the changes.

3.2.4.5.3 Advanced

- Click on **Advanced** link under the **Wireless** drop-down menu. This page allows you to configure the fragmentation threshold, RTS threshold, beacon period, transmit power, DTIM Period, etc.



- **Fragment Threshold**: Packets over the specified size will be fragmented in order to improve performance on noisy networks. Specify a value between 256 and 2346. The default value is 2346.
- **RTS Threshold**: Packets over the specified size will use the RTS/CTS mechanism to maintain performance in noisy networks and preventing hidden nodes from degrading the performance. Specify a value between 0 and 2347. The default value is 2346.
- **Beacon Interval**: Beacons are packets sent by a wireless Access Point to synchronize wireless devices. Specify a Beacon Period value between 20 and 1000. The default value is set to 100 milliseconds.
- **DITM Period**: A DTIM is a countdown informing clients of the next window for listening to broadcast and multicast messages. When the wireless Access Point has buffered broadcast or multicast messages for associated clients, it sends the next DTIM with a DTIM Period value. Wireless clients detect the beacons and awaken to receive the broadcast and multicast messages. The default value is 1. Valid settings are between 1 and 10.
- **Data Rate**: You may select a data rate from the drop-down list, however, it is recommended to select **auto**. This is also known as auto-fallback.
- **N Data Rate**: You may select a data rate for 802.11n from the drop-down list, however, it is recommended to select **auto**. This is also known as auto-fallback.
- **Channel Bandwidth**: You may select a channel bandwidth in order to improve the efficiency of the network, however, it is recommended to select **Auto 20/40MHz**. This is also known as auto-fallback.

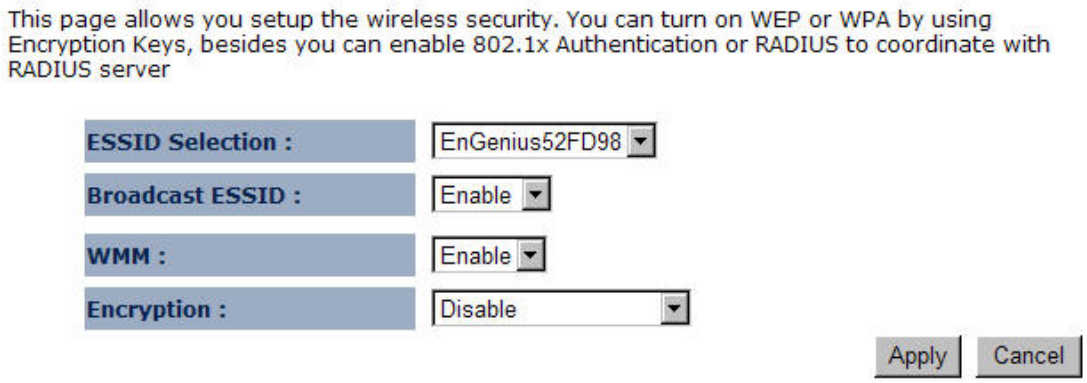
- **Preamble Type**: Select a short or long preamble. For optimum performance it is recommended to also configure the client device as the same preamble type.
- **CTS Protection**: CTS (Clear to Send) can be always enabled, auto, or disabled. By enabled CTS, the Access Point and clients will will wait for a 'clear' signal before transmitting. It is recommended to select **auto**.
- **Tx Power**: You may control the transmit output power of the device by selecting a value from the drop-down list. This feature can be helpful in restricting the coverage area of the wireless network.
- Click on the **Apply** button to save the changes.

3.2.4.5.4 Wireless Security Mode

- Click on the **Security** link under the **Wireless** drop-down menu. To protect your privacy this mode supports several types of wireless security: WEP WPA, WPA2, and 802.1x RADIUS. WEP is the original wireless encryption standard. WPA provides a higher level of security. The following section describes the security configuration in detail.

3.2.4.5.4.1 Security Disabled

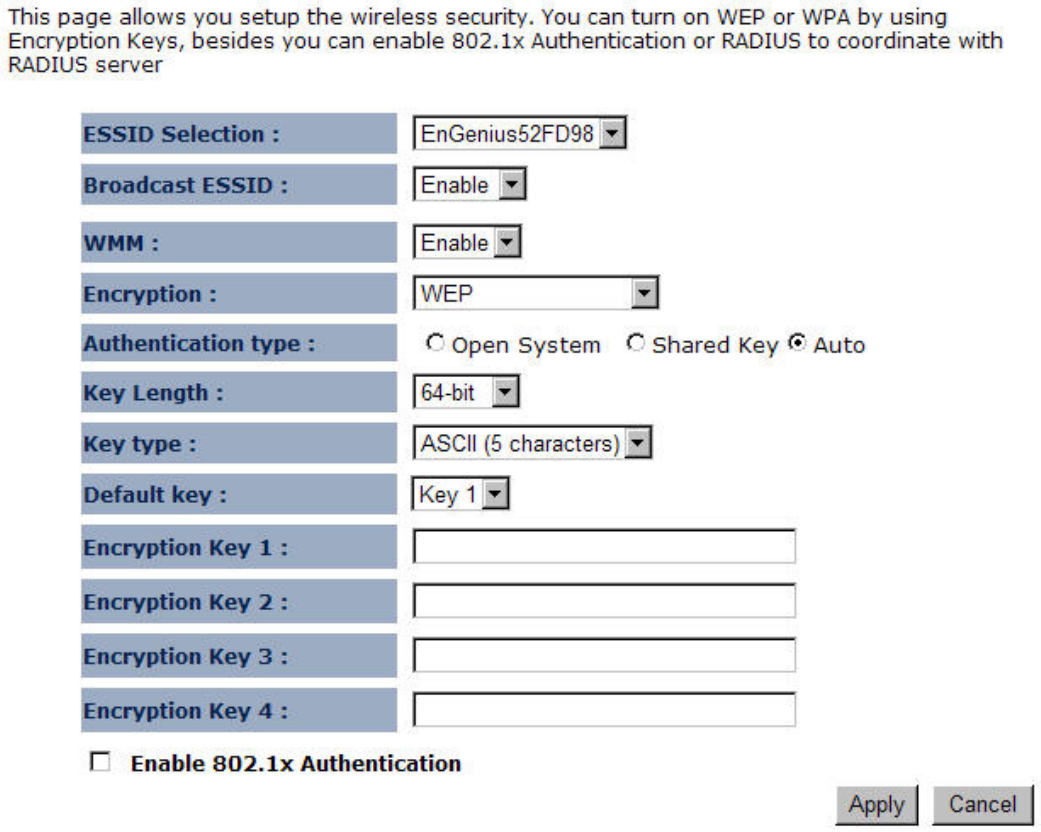
- Click on the **Security** link under the **Wireless** drop-down menu.


This page allows you setup the wireless security. You can turn on WEP or WPA by using Encryption Keys, besides you can enable 802.1x Authentication or RADIUS to coordinate with RADIUS server
ESSID Selection :
EnGenius52FD98
Broadcast ESSID :
Enable
WMM :
Enable
Encryption :
Disable
Apply
Cancel

- **ESSID Selection**: As this device supports multiple SSIDs, it is possible to configure a different security mode for each SSID (profile). Select an SSID from the drop-down list.
- **Broadcast SSID**: Select **Enable** or **Disable** from the drop-down list. This is the SSID broadcast feature. When this option is set to Enable, your wireless network name is broadcast to anyone within the range of your signal. If you're not using encryption then they could connect to your network. When this is disabled, you must enter the Wireless Network Name (SSID) on the client manually to connect to the network.
- **WMM**: Choose to **Enable** or **Disable** WMM. This is the Quality of Service (QoS) feature for prioritizing voice and video applications. This option can be further configured in **WMM** under the **Wireless** drop-down menu.
- **Encryption**: Select **Disable** from the drop-down list.
- Click on the **Apply** button to save the changes.

3.2.4.5.4.2 WEP (Wired Equivalent Privacy)

- Click on the **Security** link under the **Wireless** drop-down menu.
- WEP is an acronym for Wired Equivalent Privacy, and is a security protocol that provides the same level of security for wireless networks as for a wired network.
- WEP is less secure as compares to WPA encryption. To gain access to a WEP network, you must know the key. The key is a string of characters that you use for password. When using WEP, you must determine the level of encryption.
- The type of encryption determines the key length. 128-bit encryption requires a longer key than 64-bit encryption. Keys are defined by entering in a string in HEX (hexadecimal - using characters 0-9, A-F) or ASCII (American Standard Code for Information Interchange - alphanumeric characters) format. ASCII format is provided so you can enter a string that is easier to remember. The ASCII string is converted to HEX for use over the network. Four keys can be defined so that you can change keys easily. A default key is automatically generated when WEP is enabled.

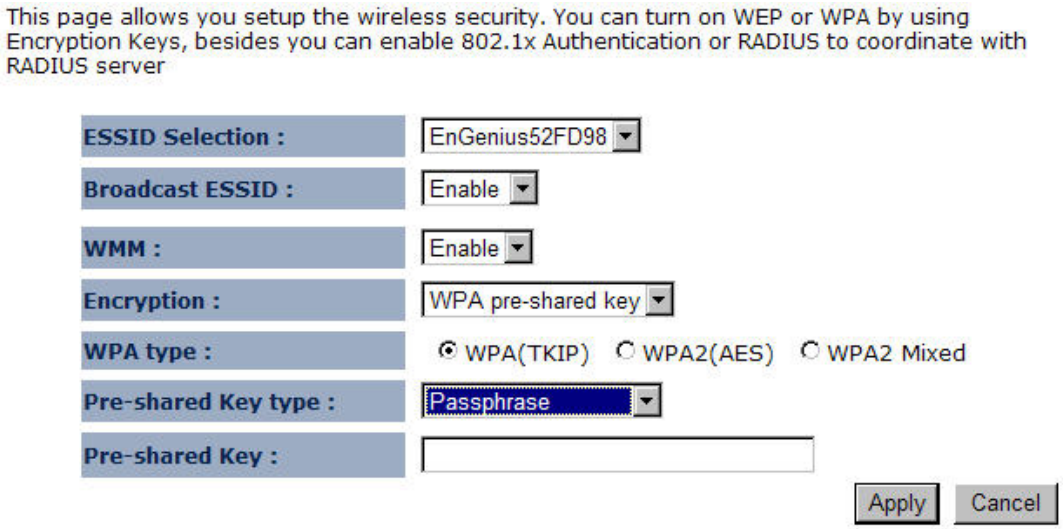


- **ESSID Selection**: As this device supports multiple SSIDs, it is possible to configure a different security mode for each SSID (profile). Select an SSID from the drop-down list.
- **Broadcast SSID**: Select **Enable** or **Disable** from the drop-down list. This is the SSID broadcast feature. When this option is set to Enable, your wireless network name is broadcast to anyone within the range of your signal. If you're not using encryption then they could connect to your network. When this is disabled, you must enter the Wireless Network Name (SSID) on the client manually to connect to the network.

- **WMM**: Choose to **Enable** or **Disable** WMM. This is the Quality of Service (QoS) feature for prioritizing voice and video applications. This option can be further configured in **WMM** under the **Wireless** drop-down menu.
- **Encryption**: Select **WEP** from the drop-down list.
- **Authentication Type:** Select **Open System**, **Shared Key, or auto**. Authentication method from the drop-down list. An open system allows any client to authenticate as long as it conforms to any MAC address filter policies that may have been set. All authentication packets are transmitted without encryption. Shared Key sends an unencrypted challenge text string to any device attempting to communicate with the AP. The device requesting authentication encrypts the challenge text and sends it back to the access point. If the challenge text is encrypted correctly, the access point allows the requesting device to authenticate. It is recommended to select Auto if you are not sure which authentication type is used.
- **Key Length**: Select a **64-bit** or **128-bit** WEP key length from the drop-down list.
- **Key Type**: Select a key type from the drop-down list. 128-bit encryption requires a longer key than 64-bit encryption. Keys are defined by entering in a string in **HEX** (hexadecimal - using characters 0-9, A-F) or **ASCII** (American Standard Code for Information Interchange - alphanumeric characters) format. ASCII format is provided so you can enter a string that is easier to remember.
- **Default Key**: You may choose one of your 4 different WEP keys from below.
- **Encryption Key 1-4:** You may enter four different WEP keys.
- **Enable 802.1x Authentication**: Place a check in this box if you would like to use RADIUS authentication. This option works with a RADIUS Server to authenticate wireless clients. Wireless clients should have established the necessary credentials before attempting to authenticate to the Server through this Gateway. Furthermore, it may be necessary to configure the RADIUS Server to allow this Gateway to authenticate users. You will then be required to specify the RADIUS Server's IP address, port, and password.
- Click on the **Apply** button to save the changes.

3.2.4.5.4.3 WPA (Wi-Fi Protected Access) / Pre-shared Key

- Click on the **Security** link under the **Wireless** drop-down menu.
- WPA (Wi-Fi Protected Access) is designed to improve upon the security features of WEP (Wired Equivalent Privacy). The technology is designed to work with existing Wi-Fi products that have been enabled with WEP. WPA provides improved data encryption through the Temporal Integrity Protocol (TKIP), which scrambles the keys using a hashing algorithm and by adding an integrity checking feature which makes sure that keys haven't been tampered with.



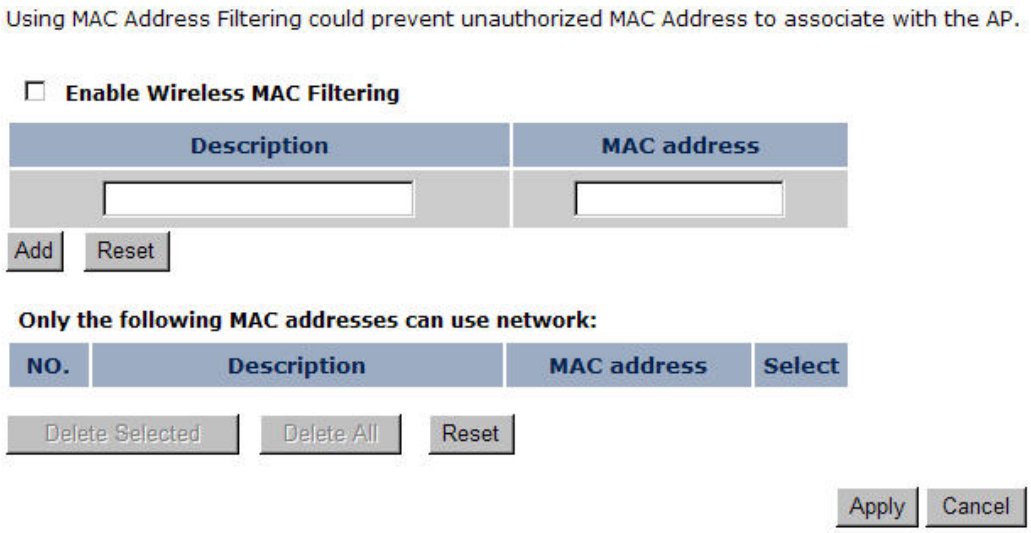
- **ESSID Selection**: As this device supports multiple SSIDs, it is possible to configure a different security mode for each SSID (profile). Select an SSID from the drop-down list.
- **Broadcast SSID**: Select **Enable** or **Disable** from the drop-down list. This is the SSID broadcast feature. When this option is set to Enable, your wireless network name is broadcast to anyone within the range of your signal. If you're not using encryption then they could connect to your network. When this is disabled, you must enter the Wireless Network Name (SSID) on the client manually to connect to the network.
- **WMM**: Choose to **Enable** or **Disable** WMM. This is the Quality of Service (QoS) feature for prioritizing voice and video applications. This option can be further configured in **WMM** under the **Wireless** drop-down menu.
- **Encryption**: Select **WPA pre-shared key** from the drop-down list.
- **WPA Type**: Select TKIP, AES, or WPA2 Mixed. The encryption algorithm used to secure the data communication. **TKIP** (Temporal Key Integrity Protocol) provides per-packet key generation and is based on WEP. **AES** (Advanced Encryption Standard) is a very secure block based encryption. Note that, if the bridge uses the AES option, the bridge can associate with the access point only if the access point is also set to use only AES.
- **Pre-shared Key Type:**: The Key Type can be **passphrase** or **Hex** format.
- **Pre-Shared Key**: The key is entered as a pass-phrase of up to 63 alphanumeric characters in ASCII (American Standard Code for Information Interchange) format at both ends of the wireless connection. It cannot be shorter than eight characters, although for proper security it needs to be of ample length and should not be a

commonly known phrase. This phrase is used to generate session keys that are unique for each wireless client.

- Click on the **Apply** button to save the changes.

3.2.4.5.5 Filter

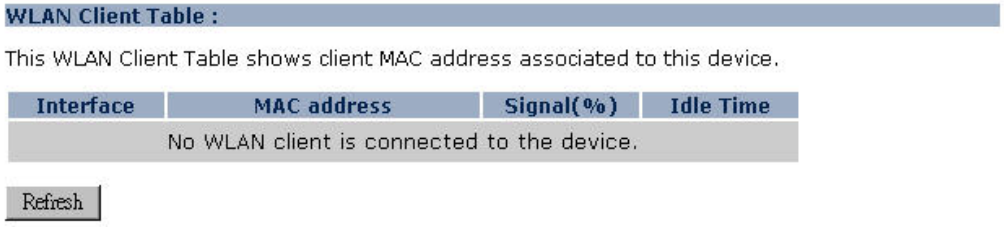
You will be able to block out connections from unauthorized MAC Address by setting filter policy.



- Check on the **Enable Wireless MAC Filtering**
- Type in Description as a note for your own reference
- Enter the MAC address that you allow for accessing to your device
- Press Add to apply the policy
- Click Apply for the setting to take effect

3.2.4.5.6 Client List

- Click on the **Client List** link under the **Wireless** drop-down menu. This page displays the list of Clients that are associated to the device.
- The MAC address and signal strength for each client is displayed. Click on the **Refresh** button to refresh the client list



WLAN Client Table :

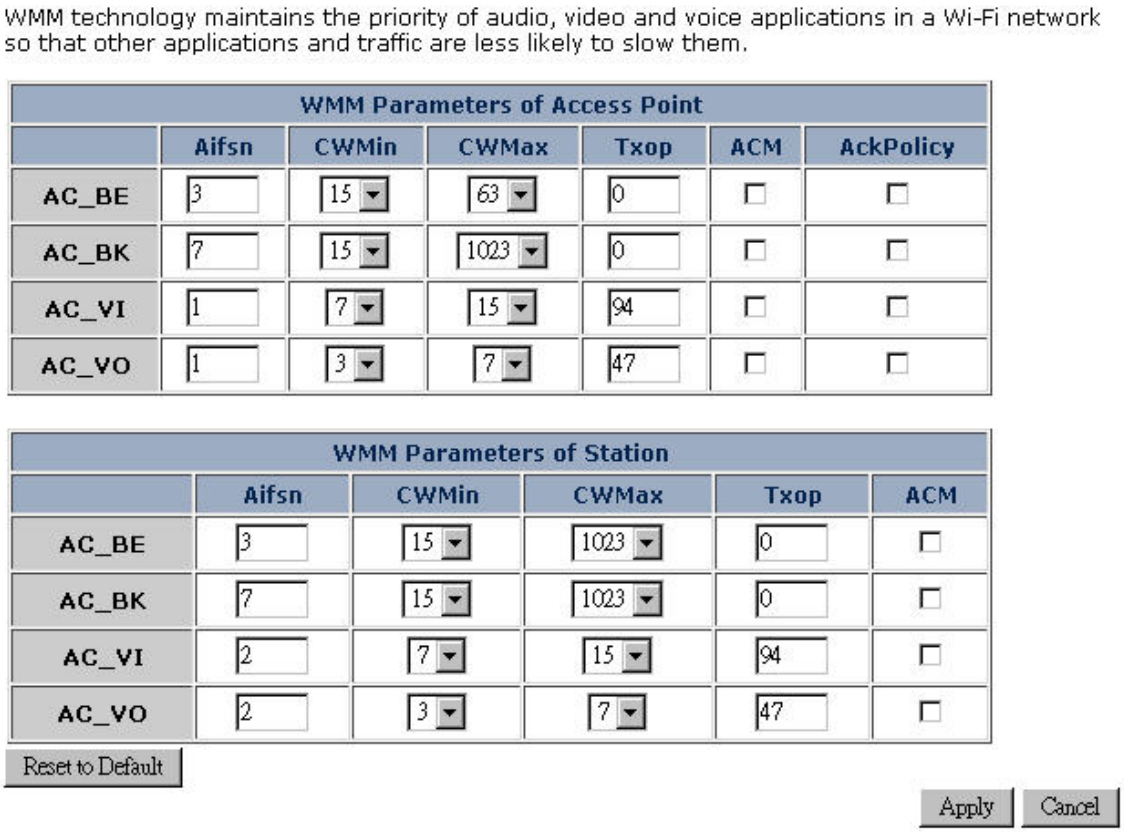
This WLAN Client Table shows client MAC address associated to this device.

Interface	MAC address	Signal(%)	Idle Time
No WLAN client is connected to the device.			

Refresh

3.2.4.5.7 WMM (Wireless Multimedia)

- Click on the **WMM** link under the **Wireless** drop-down menu. WMM is Quality of Service (QoS) for wireless and ensures that voice and video applications get priority in order to run smoothly.
- Specify the priority and then click on the **Apply** button.



WMM technology maintains the priority of audio, video and voice applications in a Wi-Fi network so that other applications and traffic are less likely to slow them.

WMM Parameters of Access Point

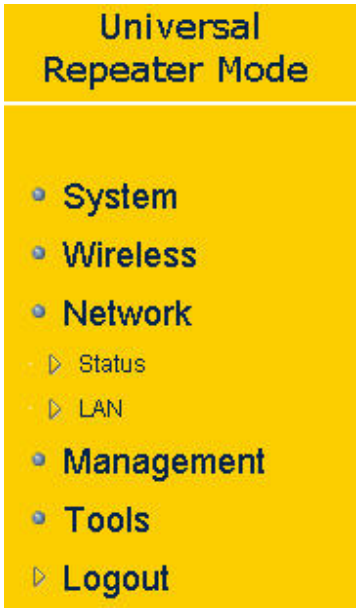
	Aifsn	CWMin	CWMax	Txop	ACM	AckPolicy
AC_BE	3	15	63	0	☐	☐
AC_BK	7	15	1023	0	☐	☐
AC_VI	1	7	15	94	☐	☐
AC_VO	1	3	7	47	☐	☐

WMM Parameters of Station

	Aifsn	CWMin	CWMax	Txop	ACM
AC_BE	3	15	1023	0	☐
AC_BK	7	15	1023	0	☐
AC_VI	2	7	15	94	☐
AC_VO	2	3	7	47	☐

Reset to Default

Apply Cancel

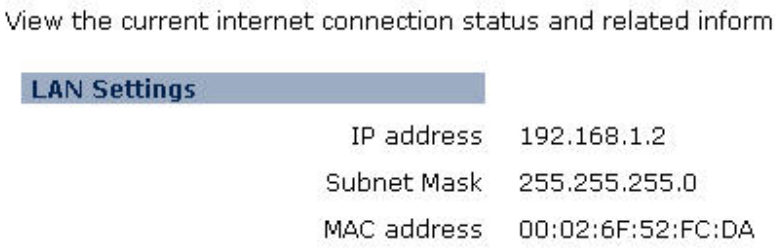


3.3 Network

- Click on the **Network** link on the navigation drop-down menu. You will then see three options: Status, LAN, and WAN. Each option is described in detail below.

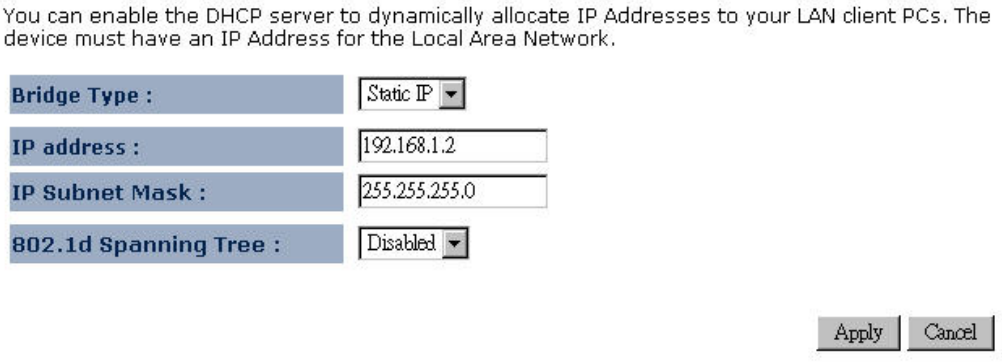
3.3.1 Status

- Click on the **Status** link on the **Network** navigation drop-down menu. This page will display the current LAN settings such as IP address, subnet mask, and MAC address.

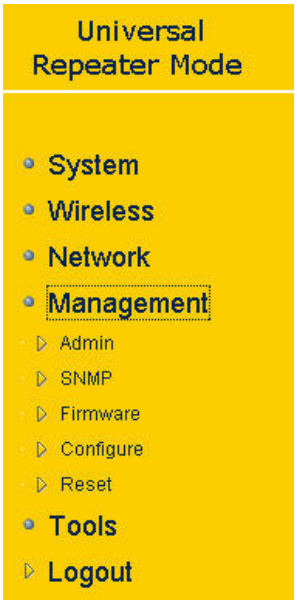

View the current internet connection status and related information.
LAN Settings
IP address 192.168.1.2
Subnet Mask 255.255.255.0
MAC address 00:02:6F:52:FC:DA

3.3.2 LAN / DHCP Client, Server

- Click on the **LAN** link on the **Network** navigation drop-down menu. This page will allow you to configure the device as a static or dynamic IP address, along with DHCP server settings.


You can enable the DHCP server to dynamically allocate IP Addresses to your LAN client PCs. The device must have an IP Address for the Local Area Network.
Bridge Type : Static IP
IP address : 192.168.1.2
IP Subnet Mask : 255.255.255.0
802.1d Spanning Tree : Disabled
Apply Cancel

- **Bridge Type**: Select **Static IP** or **Dynamic IP** from the drop-down list. If you select Static IP, you will be required to specify an IP address and subnet mask. If Dynamic IP is selected, then the IP address is received automatically from the external DHCP server.
- **IP Address**: Specify an IP address.
- **IP Subnet Mask**: Specify a subnet mask for the IP address.
- **802.1d Spanning Tree:** Select **Enable** or **Disable** from the drop-down list. Enabling spanning tree will avoid redundant data loops.
- **DHCP Server:** Select **Enable** or **Disable** from the drop-down list. If this is enabled, you will be required to specify the lease time, start and end IP address range, and domain name. If DHCP server is disabled, then all the clients connected to this device will need to acquire an IP address from the DHCP server behind this device.
- **Lease Time:** Select a lease time from the drop-down list.
- **Start IP:** Specify the starting IP address for the DHCP server to assign IP addresses.
- **End IP:** Specify the last IP address for the DHCP server to end assigning IP addresses.
- **Domain Name:** Specify a domain name.
- Click on the **Apply** button to save the changes.

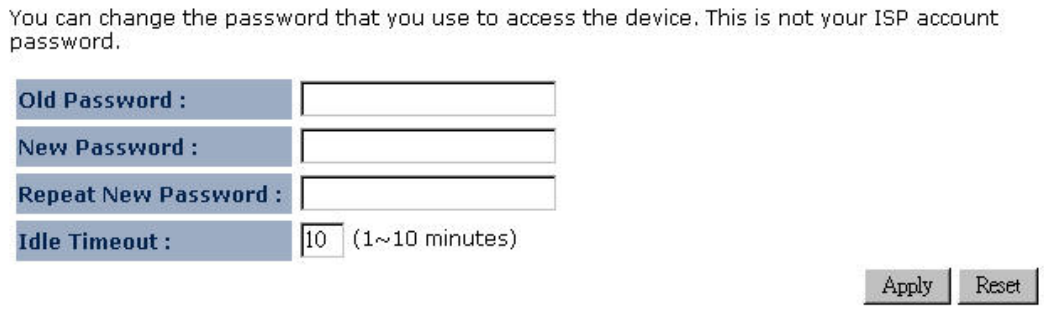


3.4 Management

- Click on the **Management** link on the navigation drop-down menu. You will then see four options: Admin, SNMP, Firmware, and Configure. Each option is described in detail below.

3.4.1 Admin

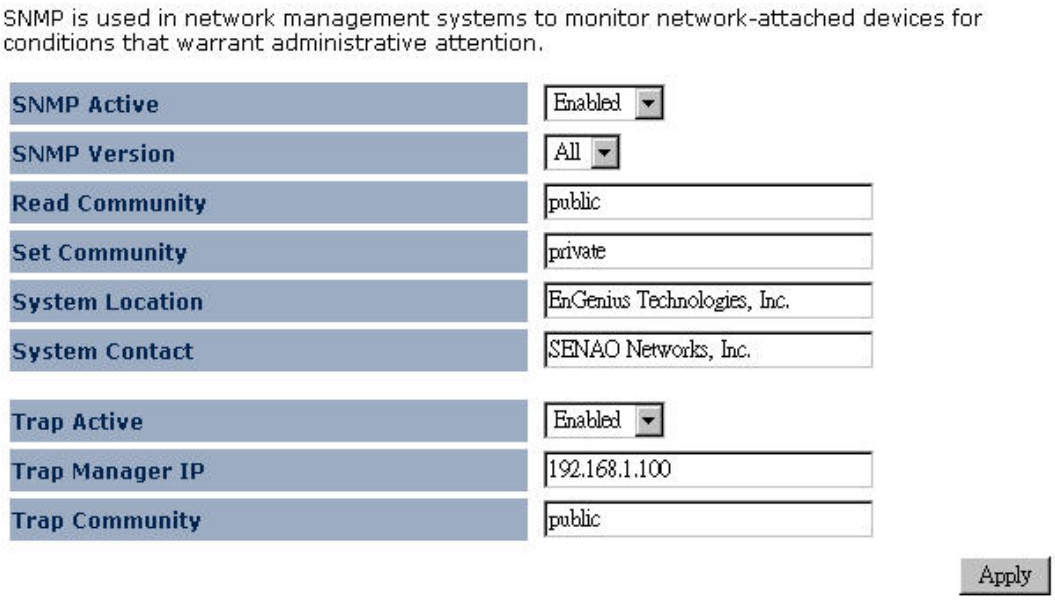
- Click on the **Admin** link on the **Management** navigation drop-down menu. This page allows you to configure a new password to login to the device. It is recommended to change the default password for security reasons.


You can change the password that you use to access the device. This is not your ISP account password.
Old Password :
New Password :
Repeat New Password :
Idle Timeout :
10
(1~10 minutes)
Apply
Reset

- Old Password: Specify the old password of the device.
- New Password: Specify a new password.
- Repeat New Password: Re-type the new password.
- Click on the **Apply** button to save the changes.

3.4.2 SNMP

- Click on the **SNMP** link on the **Management** navigation drop-down menu. This option allows you to assign the contact details, location, community name and trap settings for SNMP. This is a networking management protocol used to monitor network-attached devices. SNMP allows messages (called protocol data units) to be sent to various parts of a network. Upon receiving these messages, SNMP-compatible devices (called agents) return data stored in their Management Information Bases. .

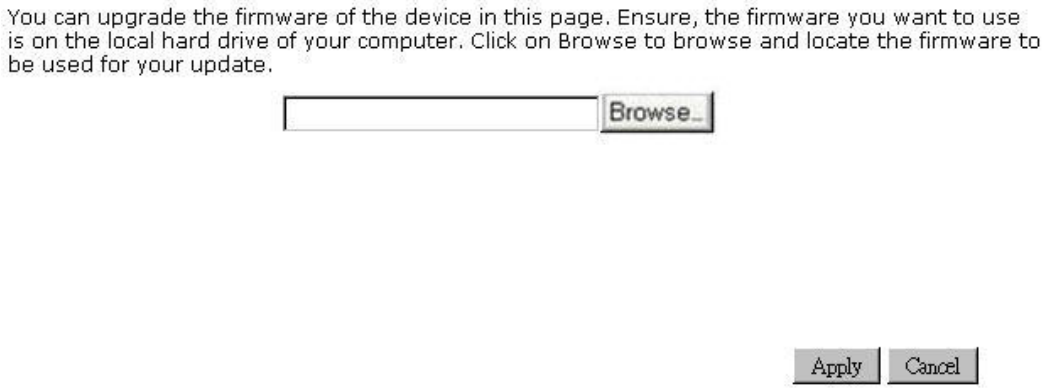


- **SNMP Active**: Choose to **enable** or **disable** the SNMP feature.
- SNMP Version: You may select a specific version or select **All** from the drop-down list.
- **Read Community Name**: Specify the password for access the SNMP community for read only access.
- **Set Community Name**: Specify the password for access to the SNMP community with read/write access.
- **System Location**: Specify the location of the device.

- **System Contact**: Specify the contact details of the device.
- **Send SNMP Trap**: Specify the IP address of the computer that will receive the SNMP traps.
- **Trap Active**: Choose to **enable** or **disable** the SNMP trapping feature. .
- **Trap Manager IP**: Specify the password for the SNMP trap community.
- Click on the **Apply** button to save the changes.

3.4.3 Firmware Upgrade

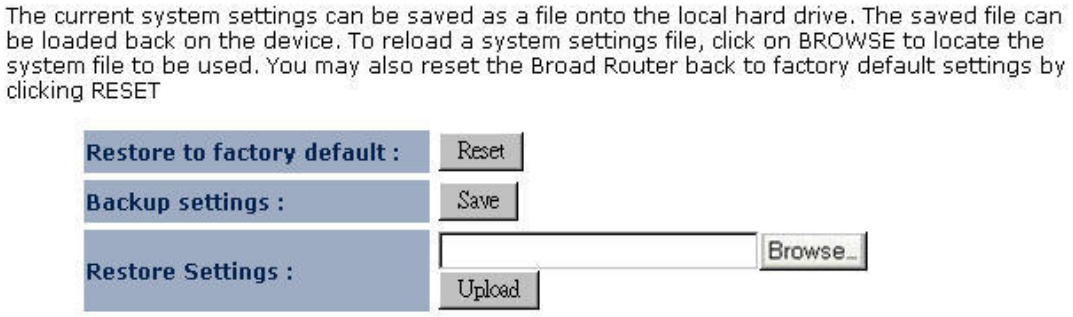
- Click on the **Firmware** link in the navigation menu. This page allows you to upgrade the firmware of the device in order to improve the functionality and performance.


You can upgrade the firmware of the device in this page. Ensure, the firmware you want to use is on the local hard drive of your computer. Click on Browse to browse and locate the firmware to be used for your update.
Browse...
Apply
Cancel

- Ensure that you have downloaded the appropriate firmware from the vendor's website. Connect the device to your PC using an Ethernet cable, as the firmware cannot be upgraded using the wireless interface.
- Click on the **Browse** button to select the firmware and then click on the **Apply** button.

3.4.4 Restore to Factory Default

- Click on the **Configure** link in the navigation menu
- Click on the **Reset** button to reset the device to the factory default settings.


The current system settings can be saved as a file onto the local hard drive. The saved file can be loaded back on the device. To reload a system settings file, click on BROWSE to locate the system file to be used. You may also reset the Broad Router back to factory default settings by clicking RESET
Restore to factory default :
Reset
Backup settings :
Save
Restore Settings :
Browse...
Upload

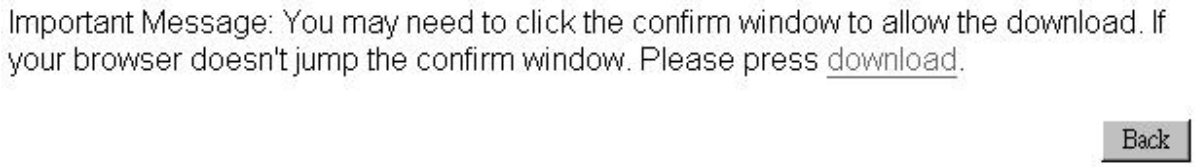
- Once the dialog box appears, click on the **OK** button to confirm the action.
  Note: The current settings will be lost.

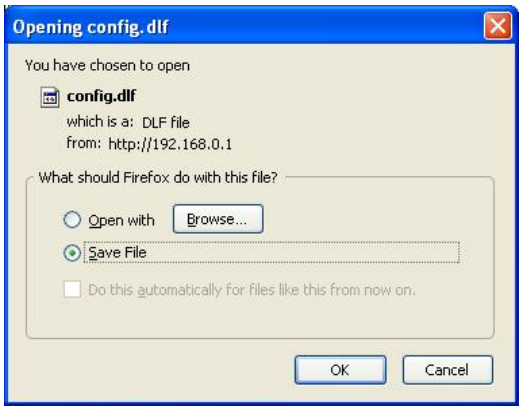
- Click on the **OK** button to continue. You will then see the **Rebooting** page.
- Please wait while the system is rebooting.

Note: Do no un-plug the device during this process as this may cause permanent damage.

3.4.5 Backup Settings

- Click on the **Configure** link in the navigation menu
- Click on the **Save** button you will be provided with download link
- Click on **download** link to save file to your local disk.
-


Important Message: You may need to click the confirm window to allow the download. If your browser doesn't jump the confirm window. Please press download.
Back



3.4.6 Restore Settings

- Click on the **Configure** link in the navigation menu

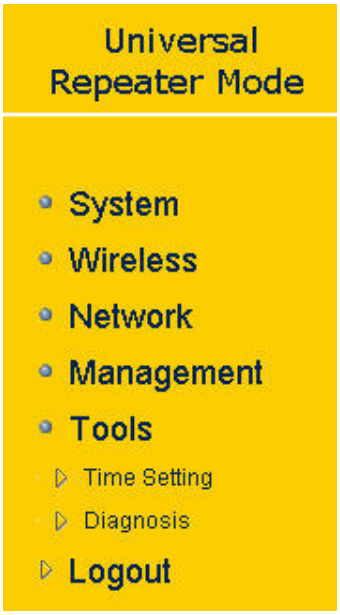
The current system settings can be saved as a file onto the local hard drive. The saved file can be loaded back on the device. To reload a system settings file, click on BROWSE to locate the system file to be used. You may also reset the Broad Router back to factory default settings by clicking RESET

- Click on the **Browse** button to select the file that has been backed up and then click on the **Upload** button.

3.4.7 Rest

In the event the system stops responding correctly or stops functioning, you can perform a reset. Your settings will not be changed. To perform the reset, click on the APPLY button. You will be asked to confirm your decision. The reset will be completed when the LED Power light stops blinking.

Press Apply to reset your device.

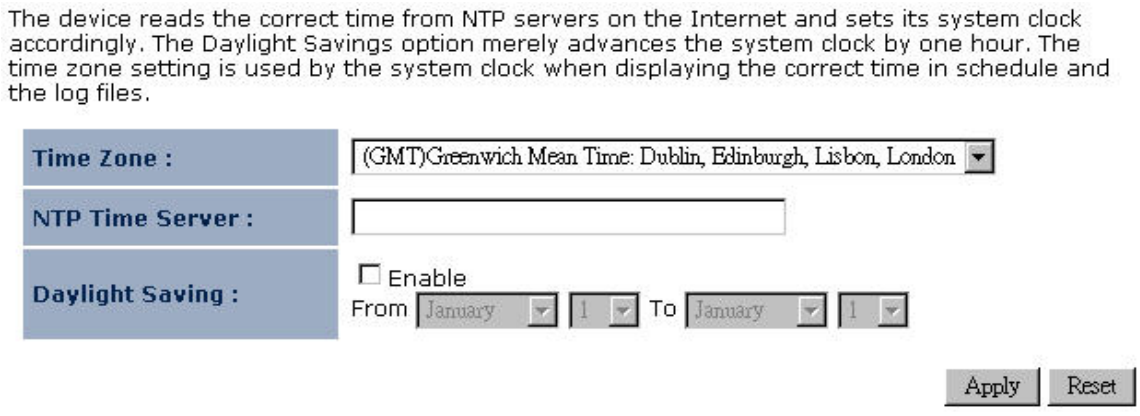


3.5 Tools

- Click on the **Tools** link on the navigation drop-down menu. You will then see four options: Time zone, power saving, diagnosis, and reset. Each option is described in detail below.

3.5.1 Time Setting

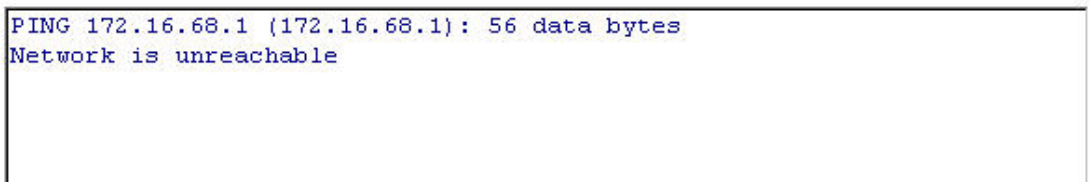
- Click on the **Time Setting** link in the navigation menu. This feature allows you to configure, update, and maintain the correct time on the device's internal system clock as well as configure the time zone. The date and time of the device can be configured manually or by synchronizing with a time server.
  Note: If the device losses power for any reason, it will not be able to keep its clock running, and will not display the correct time once the device has been restarted. Therefore, you must re-enter the correct date and time.


The device reads the correct time from NTP servers on the Internet and sets its system clock accordingly. The Daylight Savings option merely advances the system clock by one hour. The time zone setting is used by the system clock when displaying the correct time in schedule and the log files.
Time Zone :
(GMT)Greenwich Mean Time: Dublin, Edinburgh, Lisbon, London
NTP Time Server :
Daylight Saving :
Enable
From January 1 To January 1
Apply
Reset

- **Time Zone**: Select your time zone from the drop-down list.
- **NTP Time Server**: Specify the NTP server's IP address to synchronize the device's clock to a Network Time Server over the Internet.
- **Daylight Saving**: Place a check in this box to enable daylight savings time. And select the date/time from the drop-down list.
- Click on the **Apply** button to save the changes.

3.5.2 Diagnosis

- Click on the **Diagnosis** link in the navigation menu. This page allows to Ping a device to check if it is active.



- **Address to Ping**: Specify the IP address to ping and then click on the Start button. The result will then display in the field below.

Appendix A – Specifications

Hardware Summary

MCU	RT3050, 320MHz
Memory	32MB SDRAM
Flash	4MB
Expansion Slots	N/A
Physical Interface	● LAN: One 10/100Mbps ● Reset Button ● Power Jack
LEDs Status	● Power/ Status ● LAN (10/100Mbps) ● WLAN (Wireless Connection)
Power Requirements	● Power Supply: 90 to 240 VDC ± 10%, 50/60 Hz (depends on different countries) ● Device: 7.5V/1A
Regulation Certifications	● FCC Part 15/UL, CE

Radio Specifications

Frequency Band	2.400～2.484 GHz
Media Access Protocol	Carrier sense multiple access with collision avoidance (CSMA/CA)
Modulation Technology	- OFDM: BPSK, QPSK, 16-QAM, 64-QAM - DBPSK, DQPSK, CCK
Operating Channels	11 for North America, 14 for Japan, 13 for Europe
Receive Sensitivity (Typical)	- IEEE802.11n MCS0 @ -79dBm MCS7 @ -61dBm - IEEE802.11g 6Mbps@ -90dBm 54Mbps@ -70dBm - IEEE802.11b 1Mbps@ -87dBm 11Mbps@ -87dBm

Available transmit power	- IEEE802.11n/g 17dBm@6~9 Mbps / MCS0 17dBm@12~18 Mbps / MCS2 15dBm@24~36 Mbps / MCS4 14dBm@48~54 Mbps / MCS6 - IEEE802.11b 17.5dBm@1, 11Mbps
Antenna *1	Detachable Dipole antenna Peak Gain = 2 dBi (Reverse)

Software Features

<table>
<tr><td>Topology</td><td>Infrastructure</td></tr>
<tr><td>Operation Mode</td><td>Client Bridge / Access Point / WDS AP / WDS Bridge / Client Router / Router / Universal Repeater</td></tr>
<tr><td>LAN</td><td>DHCP Server
DHCP Client</td></tr>
<tr><td>Wireless</td><td>Wireless Mode – 11b / 11g / 11n / Disable
Transmission Rate
➢ 11 b/g: 54, 48, 36, 24, 18, 12, 11, 9, 6, 5.5, 2, 1 in Mbps
➢ 11n:
<table>
<tr><td rowspan="2">MCS Index</td><td colspan="2">Guard Interval 800ns</td><td colspan="2">Guard Interval 400ns</td></tr>
<tr><td>20MHz (Mbps)</td><td>40MHz (Mbps)</td><td>20MHz (Mbps)</td><td>40MHz (Mbps)</td></tr>
<tr><td>0</td><td>6.5</td><td>13.5</td><td>7.2</td><td>15</td></tr>
<tr><td>1</td><td>13</td><td>27</td><td>14.4</td><td>30</td></tr>
<tr><td>2</td><td>19.5</td><td>40.5</td><td>21.7</td><td>45</td></tr>
<tr><td>3</td><td>26</td><td>54</td><td>28.9</td><td>60</td></tr>
<tr><td>4</td><td>39</td><td>81</td><td>43.3</td><td>90</td></tr>
<tr><td>5</td><td>52</td><td>108</td><td>57.8</td><td>120</td></tr>
<tr><td>6</td><td>58.5</td><td>121.5</td><td>65</td><td>135</td></tr>
<tr><td>7</td><td>65</td><td>135</td><td>72.2</td><td>157.5</td></tr>
</table>
Signal Strength
Bandwidth Selection- 40/20 MHz for 11n</td></tr>
<tr><td>Security</td><td>WEP Encryption-64/128 bit
WPA Personal (WPA-PSK using TKIP or AES)
WPA Enterprise (WPA-EAP using TKIP)
802.1x Authenticator
802.1x Supplicant- MD5/TTLS (CB & CR mode)
Hide SSID in beacons
Multiple SSID with 802.1q VLAN tagging (up to 4 SSIDs) in AP mode</td></tr>
</table>

	MAC Filter(AP mode) WLAN L2 isolation(AP mode) Wireless STA (Client) connected list (Idle/Connection Time, Pkt statistics)
QoS	WMM

Management

Configuration	Web-based configuration (HTTP)/Telnet
Firmware Upgrade	Upgrade firmware via web-browser Keep latest setting when f/w update
Administrator Setting	Administrator password change
Reset Setting	Reboot Reset to Factory Default
System monitoring	Status, Statistics and Event Log
SNMP	V1, V2c
MIB	MIB I, MIB II (RFC1213) and Private MIB
Bandwidth Measurement	IP range and bandwidth management
Backup & Restore	Settings through Web

Environment & Physical

Temperature Range	Operating: 0°C to 45°C (32°F to 113°F) Storage: -20°C to 70°C (-4°F to 158°F)
Humidity (non-condensing)	5%～95% typical
Dimensions	125mm (L) x 108mm (W) x 31mm (H)
Weight	350g

Appendix B – FCC Interference Statement

Federal Communication Commission Interference Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

IMPORTANT NOTE:
FCC Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment.
This device complies with FCC RF Exposure limits set forth for an uncontrolled environment, under 47 CFR 2.1093 paragraph (d)(2).
This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

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